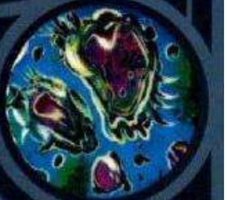

ANATOMY OF A METAHUMAN

WRITTEN BY
S.D. PERRY AND
MATTHEW K. MANNING

ILLUSTRATIONS BY
MING DOYLE

ANATOMY
OF A
METAHUMAN

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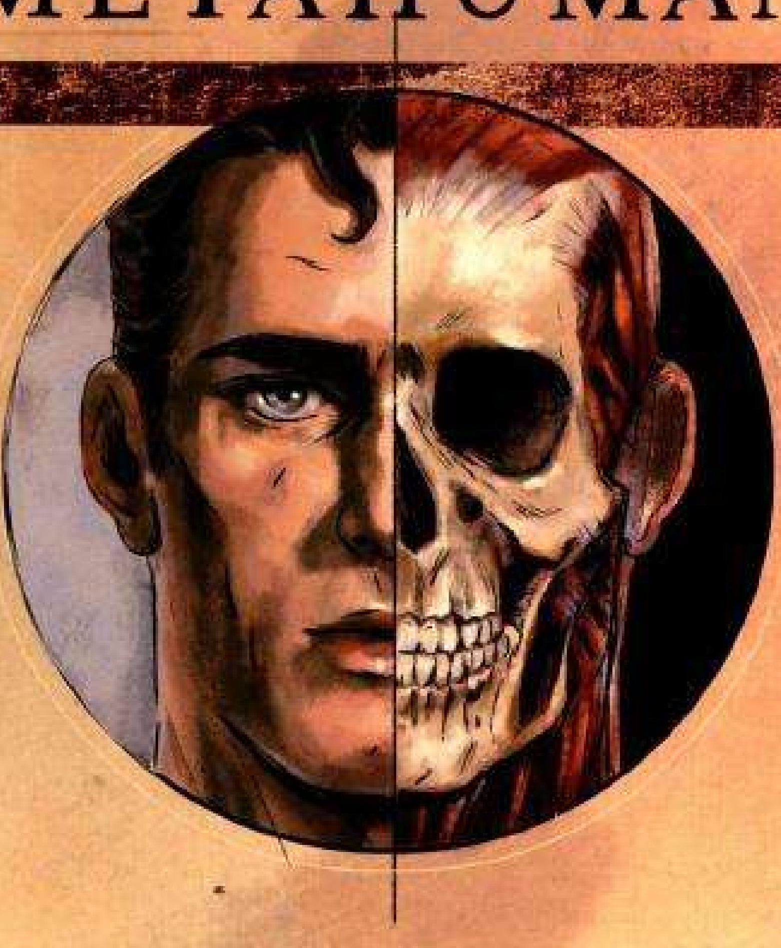
METAHUMAN

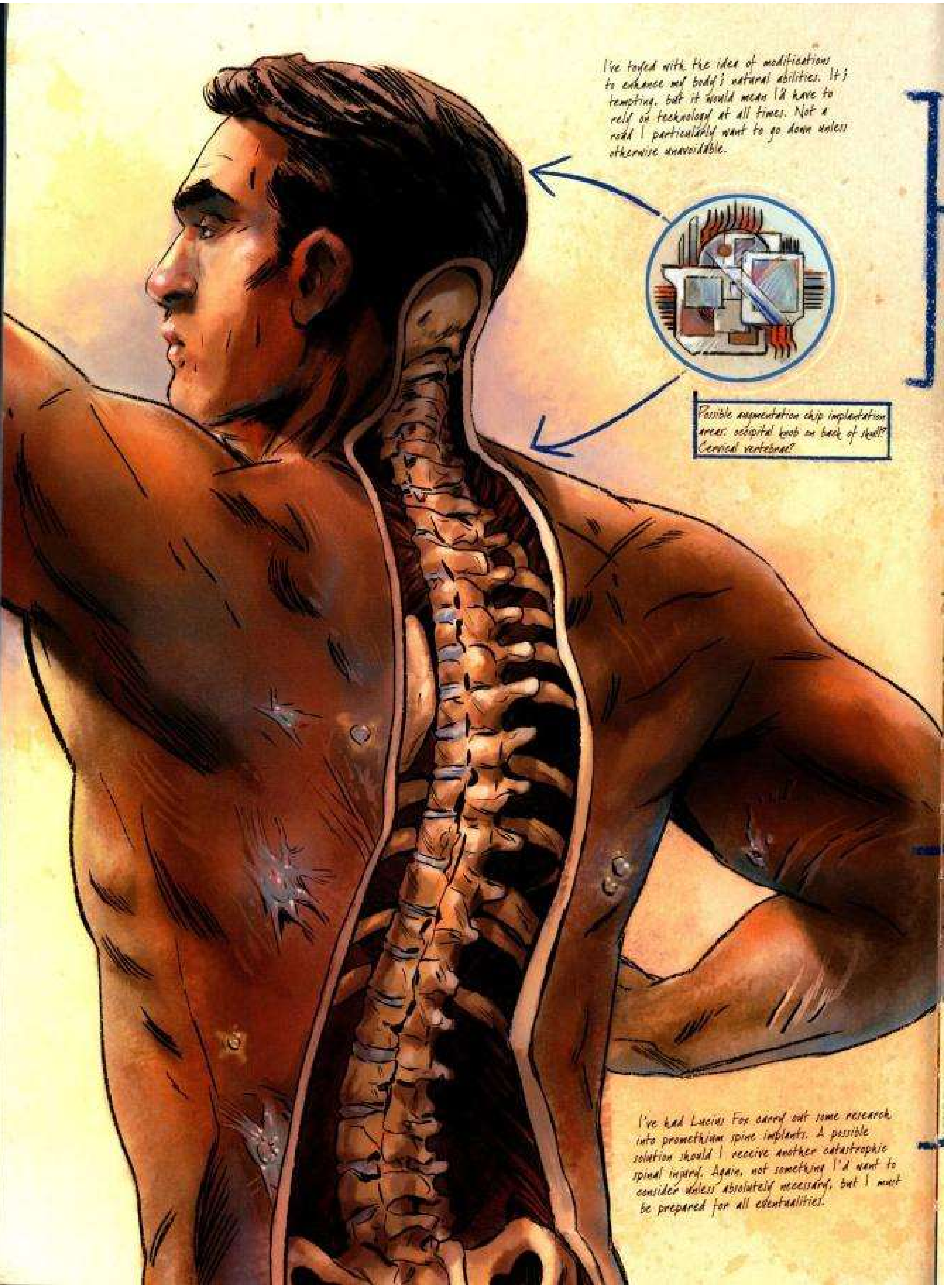


WRITTEN BY S. D. PERRY & MATTHEW K. MANNING

ILLUSTRATIONS BY MING DOYLE

COLORS BY SCOTT HOLLADAY

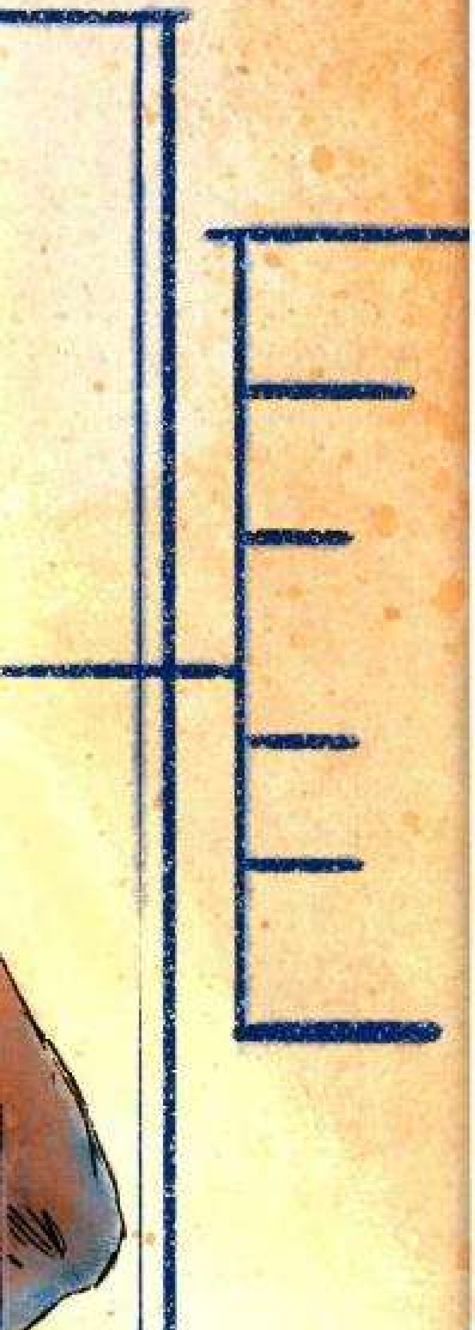
INSIGHT EDITIONS
San Rafael, California



I've toyed with the idea of modifications to enhance my body's natural abilities. It's tempting, but it would mean I'd have to rely on technology at all times. Not a road I particularly want to go down unless otherwise unavoidable.

Possible augmentation chip implantation areas: occipital knob on back of skull? Cervical vertebrae?

I've had Lucius Fox carry out some research into promethium spine implants. A possible solution should I receive another catastrophic spinal injury. Again, not something I'd want to consider unless absolutely necessary, but I must be prepared for all eventualities.



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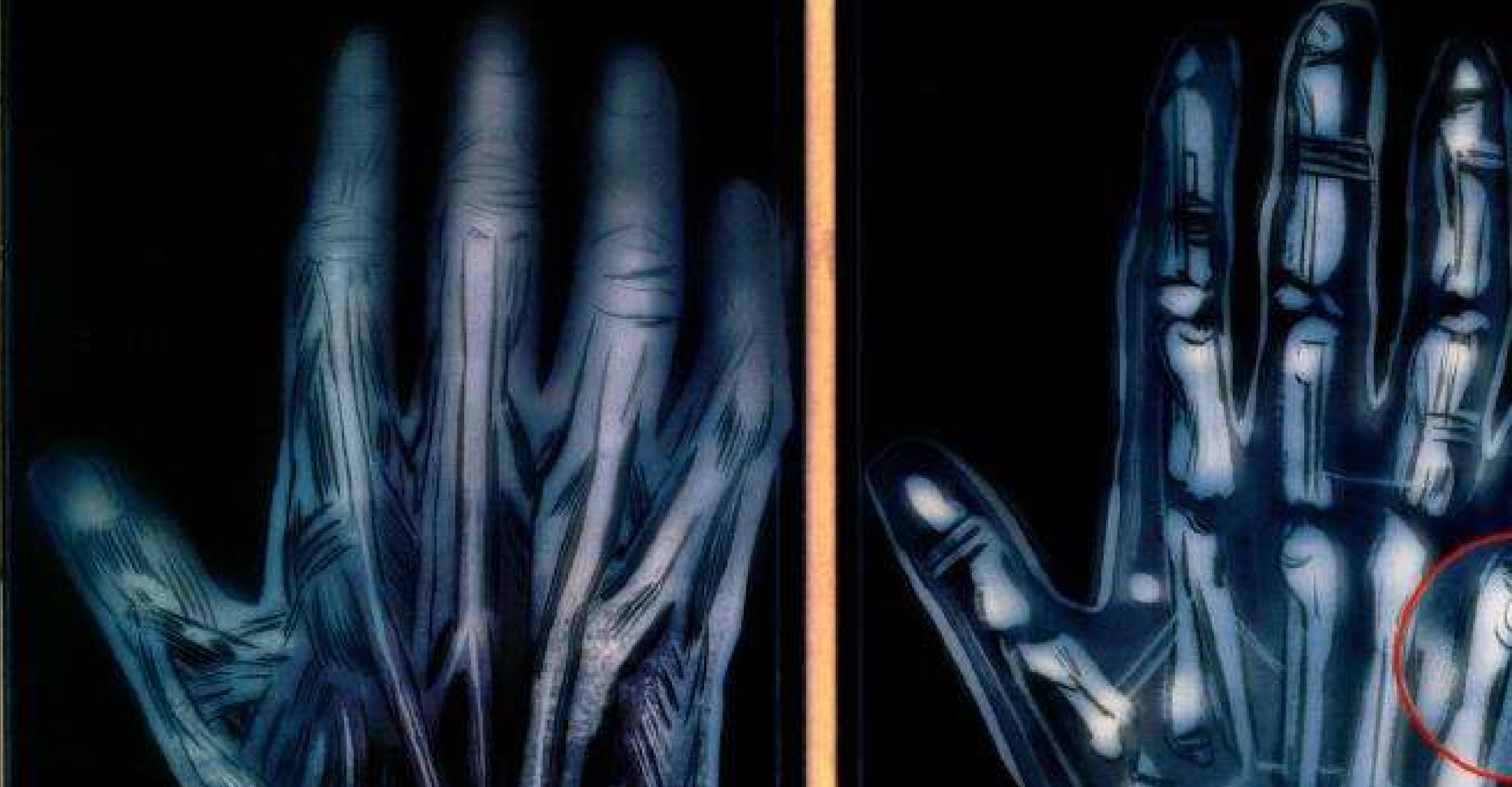
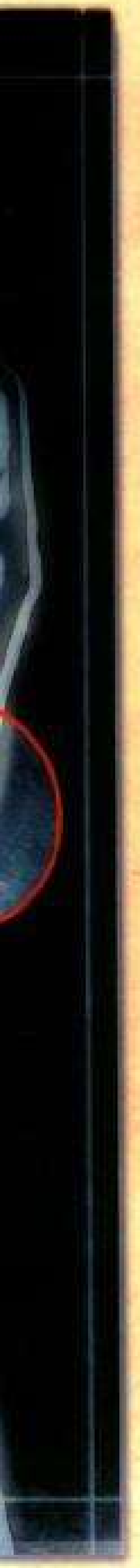


As the years go by, it becomes harder and harder to explain away my injuries to Bruce Wayne's physicians. Currently, my doctor believes I'm the world's worst skier.



Introduction

If you're reading this, then that means one of two things. Best case scenario, I'm facing enemies too big to handle alone. This book is in your hands to help you better understand the threat they pose. Worst case scenario, one of my former allies has gone rogue, and if I've handed you this information, then that means our entire world is most likely in jeopardy.

Within these pages you will find my contingency plan: nearly everything I've collected over the last several years on the anatomical makeup and physiology of a select sampling of metahumans. Included are my theories regarding how and why these aliens, cyborgs, and mutations function the way that they do. To obtain this information, I've broken into secure government sites, hacked expertly executed firewalls, and gathered evidence from crime scenes all over the world. This is what I have so far, and it's only the tip of the iceberg.

This book is meant as a last resort. But in the world we inhabit, it's foolish not to prepare for the worst. While I hope we won't have a need to use the contents of this study against our metahuman allies, the unthinkable has happened before. Friends have become enemies, heroes have become villains, and there's every possibility that it could happen again. If you're reading this, the fate of humanity may ultimately depend on what we know about these "super beings," and how we can apply that information. That's why I've spent years working on this book. Despite my best efforts, I'm still nowhere near finished, but the information gathered here is immensely valuable nonetheless.

I would be happy to see this book go unread. But past experience tells me that's an unlikely outcome. Past experience tells me that it may become our last line of defense.

Bruce Wayne

WARNING: DO NOT REPLICATE THIS DOCUMENT OR ATTEMPT TO STORE IT DIGITALLY.

We must use analog methods to protect it from powerful metahumans like Cyborg who can hack through strong firewalls in nanoseconds and download countless exabytes of information in the blink of an eye.

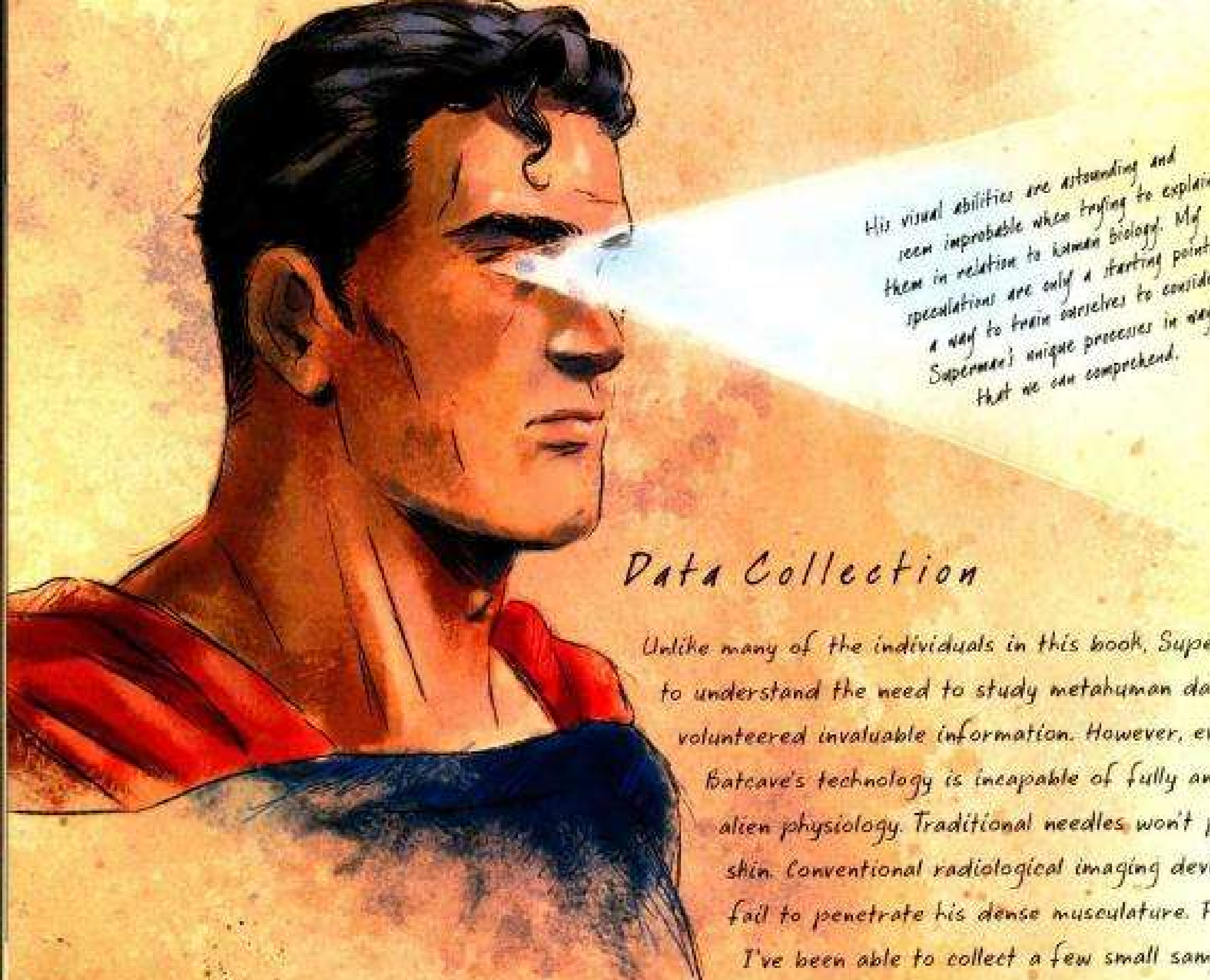
REMEMBER: EVEN OUR ALLIES CAN BE TURNED AGAINST US.

SUPERMAN

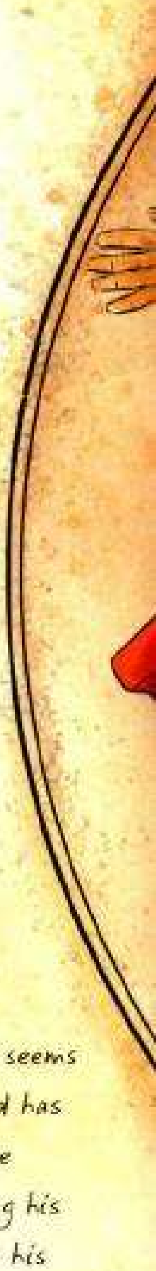
We call him Superman, a name that is elegant in its simplicity yet speaks volumes about what he truly is: godlike power in the guise of a human. His determination to use his gifts in the service of truth and justice makes it hard to imagine that there could be anyone more worthy of his moniker.

But strip away the charming smile and the Midwestern values, look beneath the iconic emblem emblazoned on his chest, and you'll discover that Superman can't possibly be the best of us, when, in fact, he isn't one of "us" at all.

A native son of a distant planet that no longer exists, Superman is one of the last survivors of Krypton. Born Kal-El, he was sent to our world as an infant so that he might live in safety among our people. Despite his extraterrestrial origins, his adopted parents did their best to instill their son, whom they called Clark, with the very best facets of humanity. But even the Kents would have admitted that humanity does not equal human.



His visual abilities are astounding and seem improbable when trying to explain them in relation to human biology. My speculations are only a starting point, a way to train ourselves to consider Superman's unique processes in ways that we can comprehend.

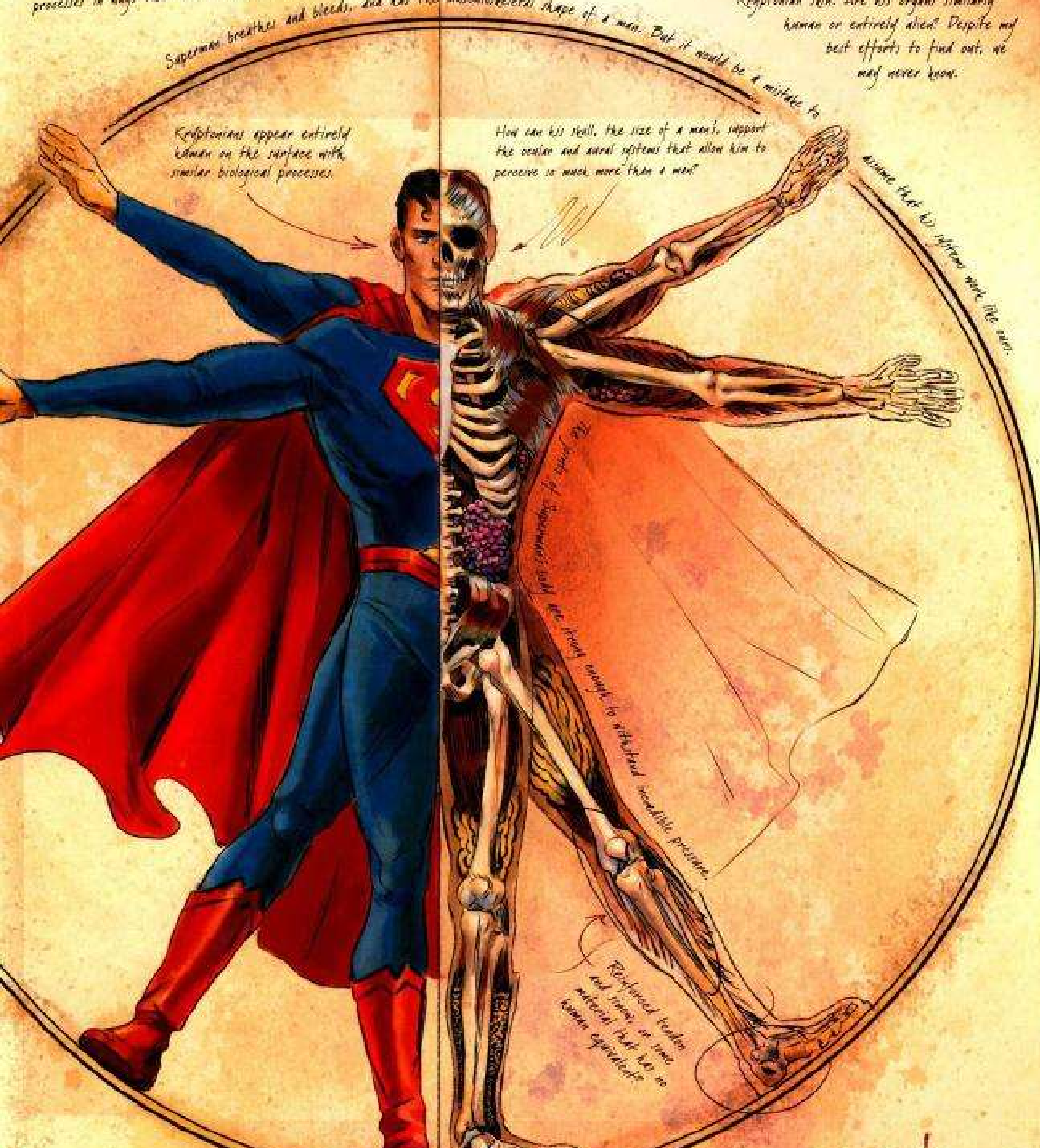


Data Collection

Unlike many of the individuals in this book, Superman seems to understand the need to study metahuman data and has volunteered invaluable information. However, even the Batcave's technology is incapable of fully analyzing his alien physiology. Traditional needles won't pierce his skin. Conventional radiological imaging devices often fail to penetrate his dense musculature. Fortunately, I've been able to collect a few small samples of blood and tissue, mostly gathered from sites where he's been injured. In many cases, the test results raised more questions than they answered.

MY SPECULATIONS are only a starting point, a way to train ourselves to consider Superman's unique processes in ways that we can comprehend.

Although he appears to be human on the surface, I can only speculate about what lies beneath his Kryptonian skin. Are his organs similarly human or entirely alien? Despite my best efforts to find out, we may never know.


Superman breathes and bleeds, and has the musculoskeletal shape of a man. But it would be a mistake to assume that his systems work like ours.
Kryptonians appear entirely human on the surface with similar biological processes.
How can his skull, the size of a man's, support the ocular and aural systems that allow him to perceive so much more than a man?
The joints of Superman's body are strong enough to withstand incredible pressure.
Reinforced tendon and tissue, or some material that has no human equivalent?

Much of my research has been focused on the composition of Superman's bones and muscles. What combination of organic structures could possibly generate his immense strength? I have many theories but all are at odds with conventional scientific thinking.

FOR FURTHER RESEARCH:

Could an X-ray machine that uses the radiation from kryptonite be a way to see beneath Superman's skin? Does this present too great a risk to Clark?

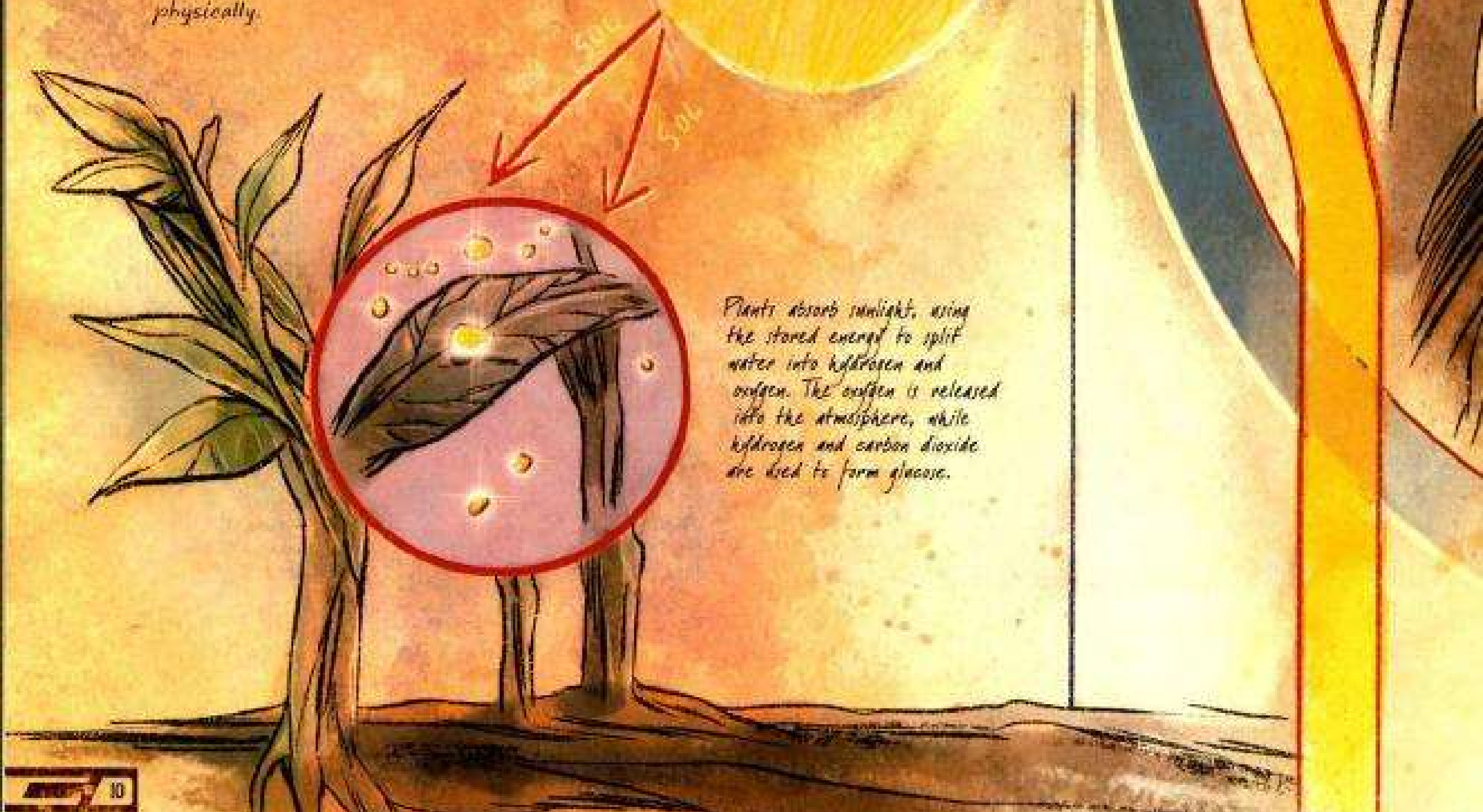
Cell Structure / Solar Power

Understanding Superman's genetic makeup may be the key to understanding the origin of his abilities. His cell structure itself lends to an understanding of the base of his power--a fact that he readily admits: Superman draws his energy from the radiation of our yellow sun.

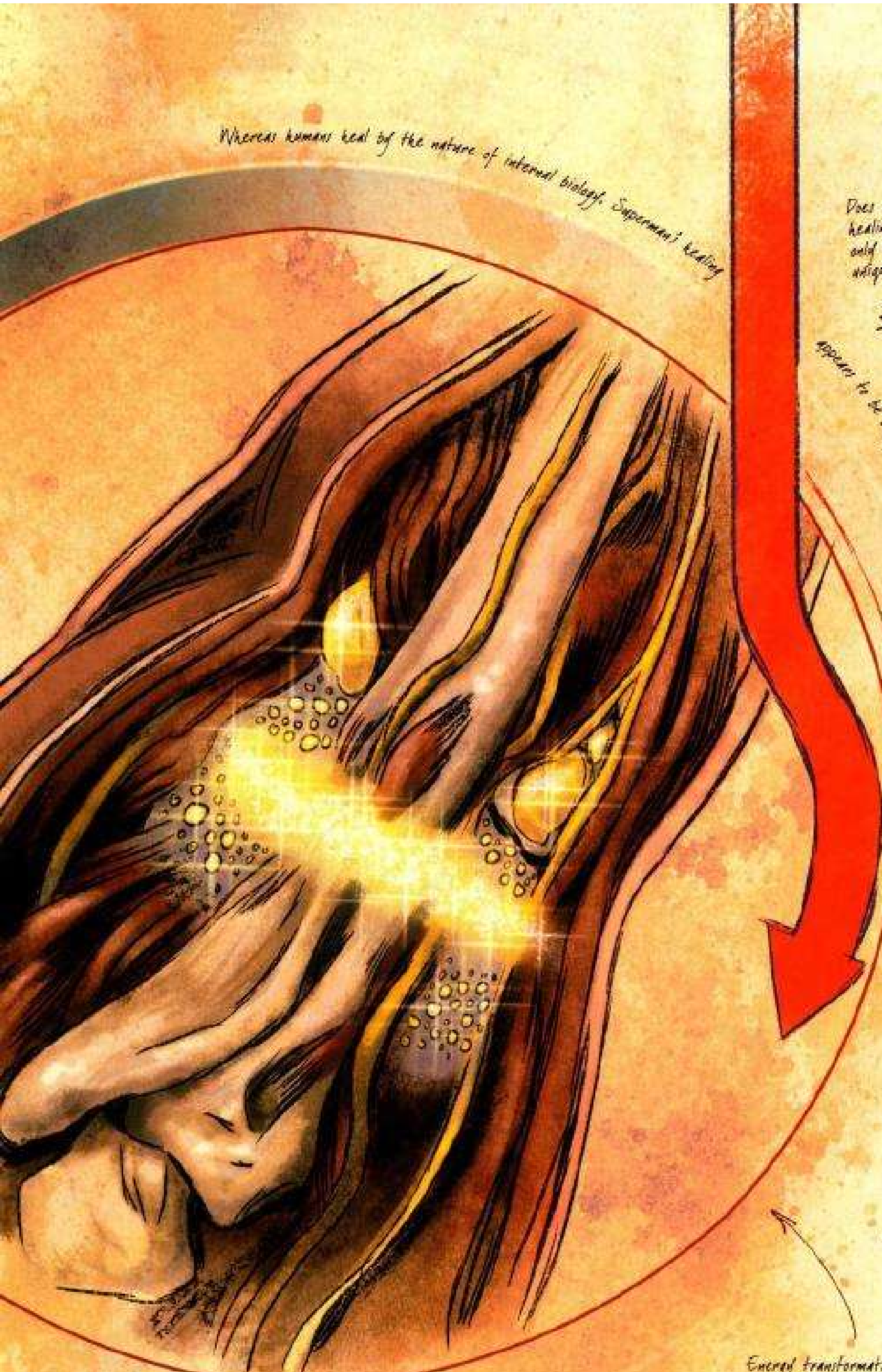
His epithelial cells appear to be unique, perhaps analogous to a hybrid of animal and plant. While membranous in appearance, they seem to share characteristics with walled plant cells and are able to photosynthesize and store energy through exposure to sunlight. It seems likely that this absorption is normal for Kryptonians, similar to our own ability to synthesize vitamin D from sunlight. Beneath Krypton's red sun, Kryptonians do not exhibit what we would deem "superpowers." Instead, their levels of strength and stamina are similar to those exhibited by the people of Earth. It appears that exposure to our sun sends Kryptonians' basic synthesis into overdrive, allowing them to tap into a nearly limitless supply of energy.

Superman walks away from events that would pulverize a human--train crashes, explosions, and devastating acts of nature. How is he able to physically resist so many tons of force? The same cells that process light so effectively must also be insulated in a very specific way.

In mammals, cytoplasm is the semifluid in each cell that cushions and protects its internal organelles. The cytoplasm in Superman's epithelial tissues, particularly his skin, may be similar to non-Newtonian fluid. A gentle touch, and his skin feels like a human's. A slap or punch, and his epidermis becomes as hard as steel, every cell protecting itself. In fact, the tensile strength of his skin appears to be far greater than that of any Earth metal, even the artificial alloy promethium. That, combined with the thickness of his epidermis and dermis--a benefit of coming from a larger and denser planet than Earth--makes it extremely difficult to damage him physically.



Plants absorb sunlight, using the stored energy to split water into hydrogen and oxygen. The oxygen is released into the atmosphere, while hydrogen and carbon dioxide are used to form glucose.



Whereas humans heal by the nature of internal biology, Superman's healing appears to be biological AND directly influenced by sunlight.

Does sunlight have a direct healing effect, or is it only a power source for his unique cellular processes?

NOTE:
Is it too simplistic to draw comparisons between photosynthesis and the effect the sun has on Superman? Perhaps I need to broaden the scope of my theories.

Energy transformation photosynthesis is the closest I can come to an answer for how Superman uses sunlight, but it's more of an analogy than a real understanding.

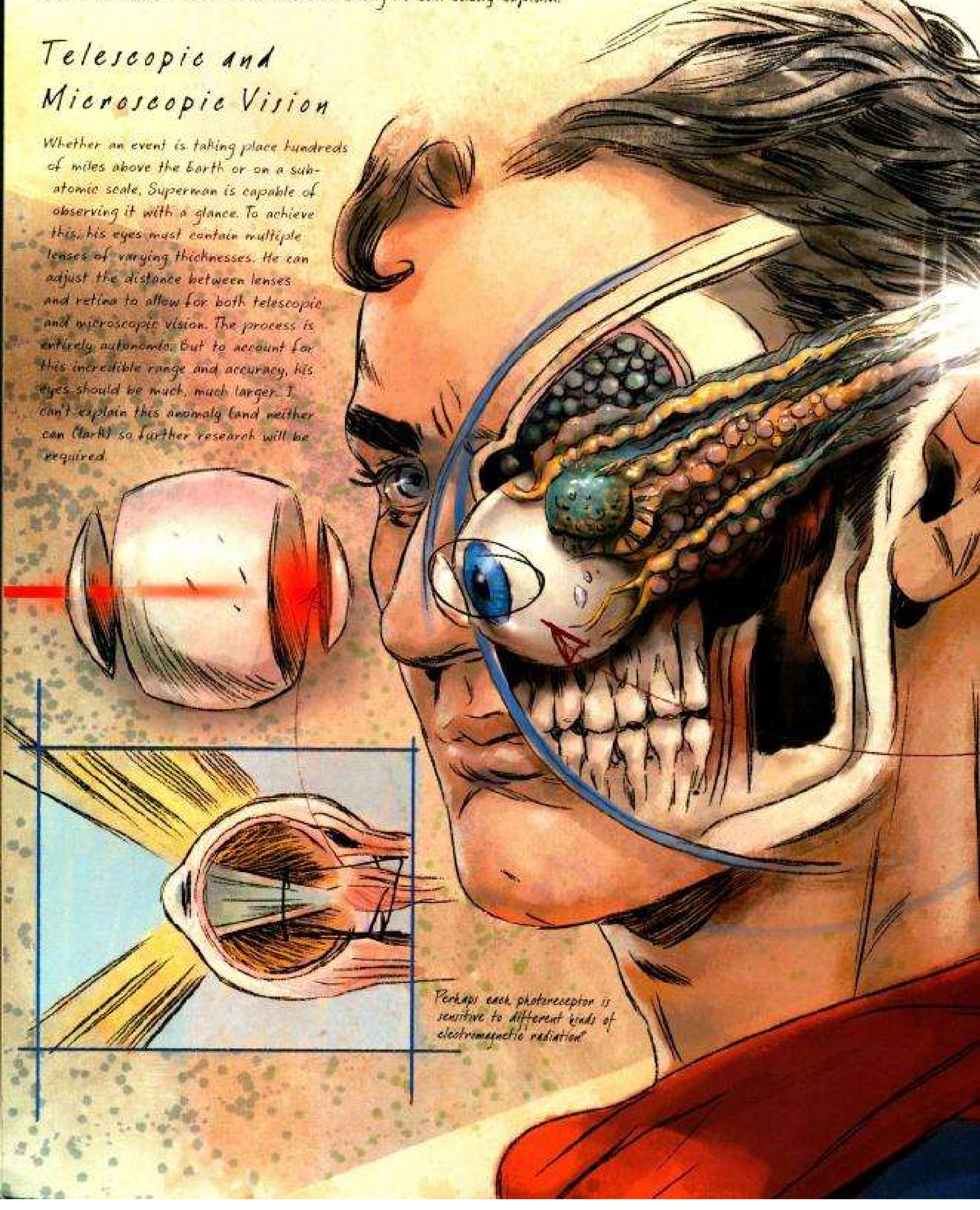
FOR FURTHER STUDY: Develop a microscope that can be better used to observe Superman's cells in limited tissue samples available. Conventional equipment not up to task.

Visual Capabilities

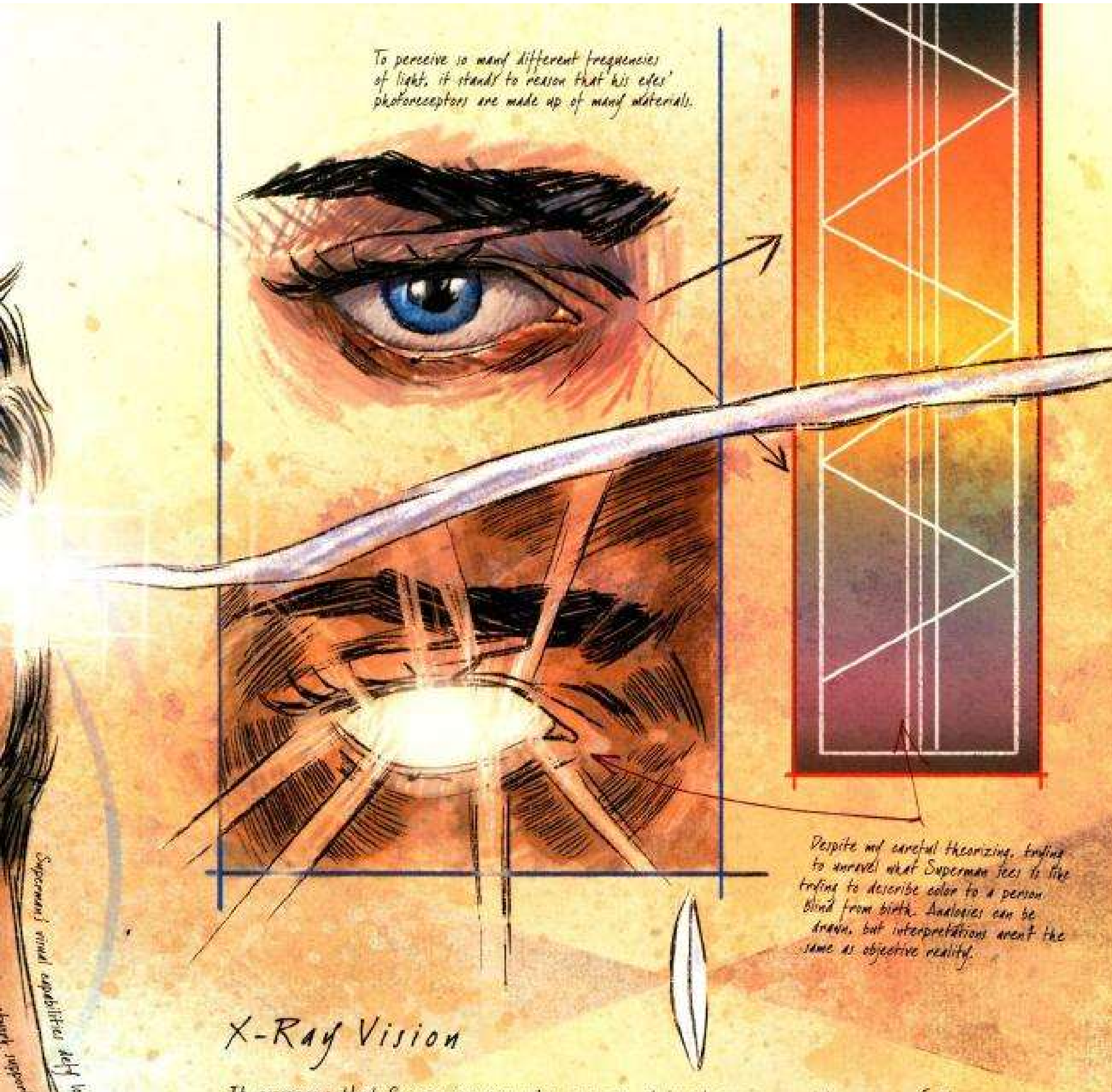
"Superman has demonstrated a wide variety of metahuman visual abilities, all of which are difficult to fully explain. Clark has been forthcoming enough with information regarding his sight, but his optical systems are so complex and so vastly different from human vision that what he "sees" is not something he can easily explain.

Telescopic and Microscopic Vision

Whether an event is taking place hundreds of miles above the Earth or on a subatomic scale, Superman is capable of observing it with a glance. To achieve this, his eyes must contain multiple lenses of varying thicknesses. He can adjust the distance between lenses and retina to allow for both telescopic and microscopic vision. The process is entirely autonomic. But to account for this incredible range and accuracy, his eyes should be much, much larger. I can't explain this anomaly (and neither can Clark) so further research will be required.



Perhaps each photoreceptor is sensitive to different kinds of electromagnetic radiation?



To perceive so many different frequencies of light, it stands to reason that his eyes' photoreceptors are made up of many materials.

Despite my careful theorizing, trying to unravel what Superman sees is like trying to describe color to a person blind from birth. Analogies can be drawn, but interpretations aren't the same as objective reality.

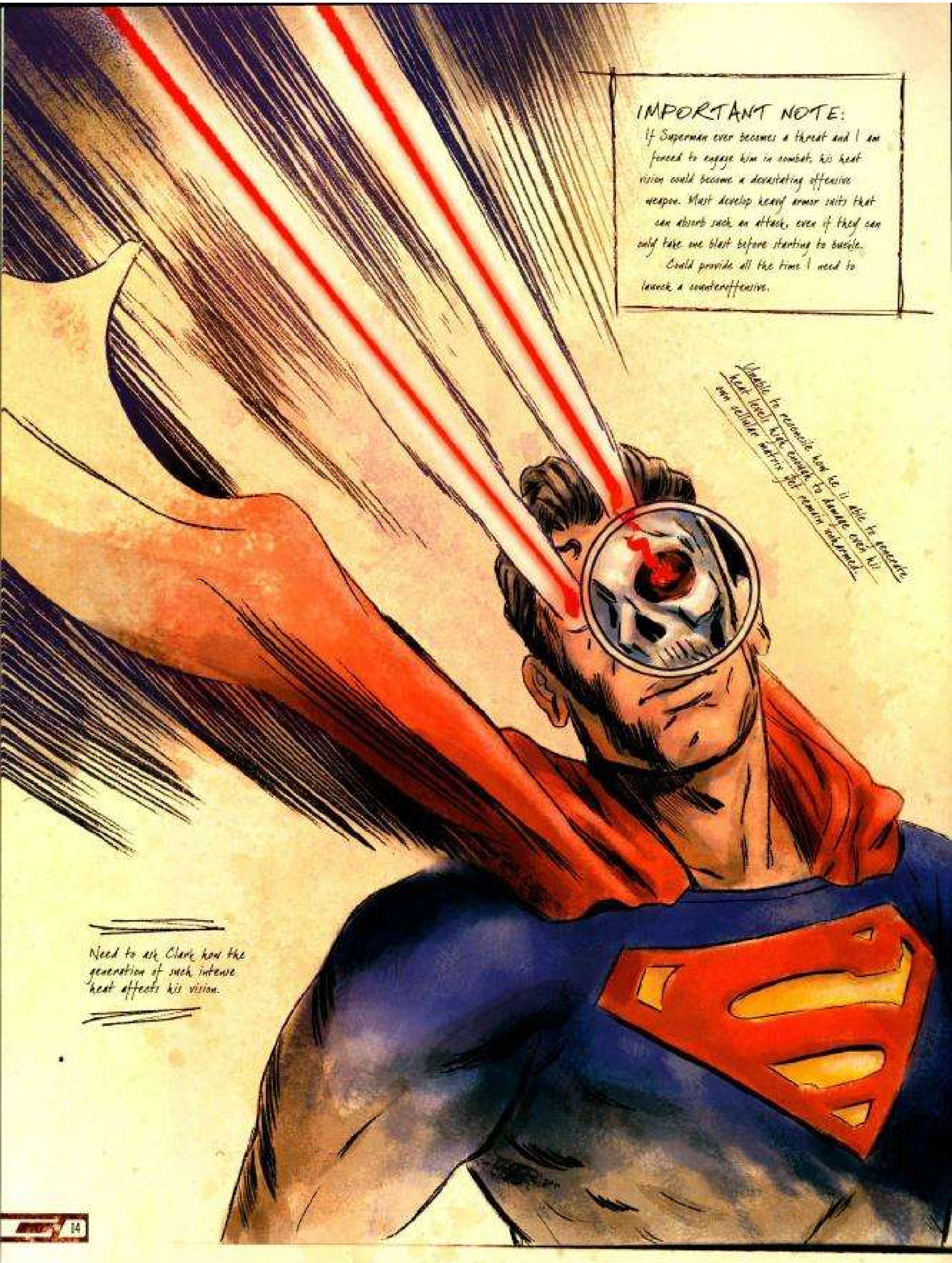
Superman's visual capabilities defy logic.

should support all that he can do?

X-Ray Vision

It appears that Superman can also see, or at least sense, a wide range of the electromagnetic spectrum, from megameter-long waves to X-ray and gamma waves. The distinctly alien composition of his eyes allows him to alter and even reflect some of these waves. While he has the ability to see through all materials except lead, the term "X-ray vision" is actually a misnomer, considering that the objects he scans are not irradiated. Perhaps he can detect particle density patterns, or perceive the lengths of radio and sound waves in complex layers and visually observe how they interact and reflect from matter.

Another theory: muons, the detritus of cosmic rays, settle to the surface of our planet at something like 10,000 per square meter per second. If Superman were able to sense how these decaying particles interact with matter, the ability might be likened to X-ray vision.



IMPORTANT NOTE:
If Superman ever becomes a threat and I am forced to engage him in combat, his heat vision could become a devastating offensive weapon. Must develop heavy armor suits that can absorb such an attack, even if they can only take one blast before starting to buckle.

Could provide all the time I need to launch a counteroffensive.

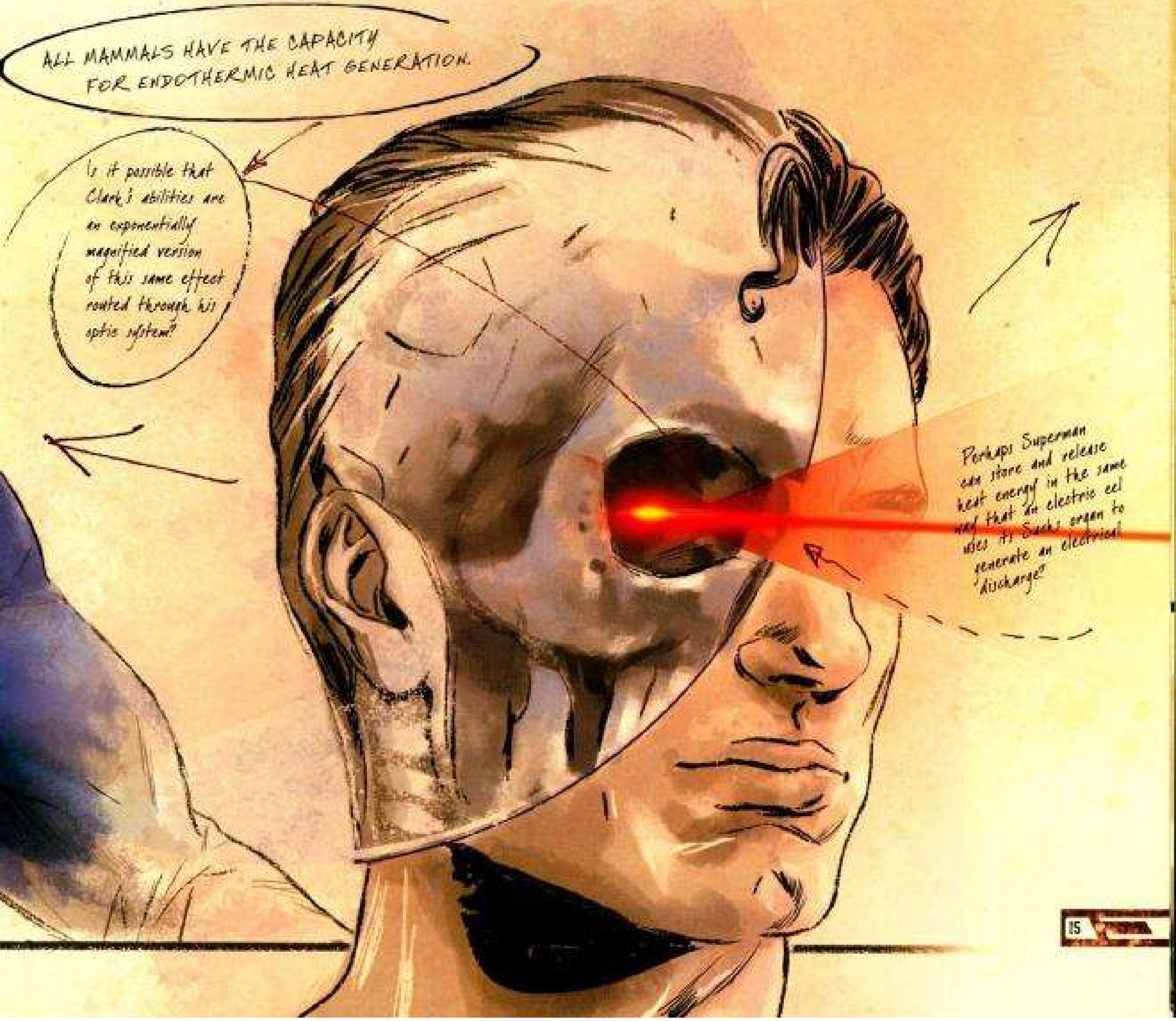
Unable to reconcile how he is able to generate heat levels high enough to damage even his own cellular matrix yet remain unharmed.

Need to ask Clark how the generation of such intense heat affects his vision.

Heat Vision

Superman can project energy from his eyes, creating directed beams of radiation. Clark says that the energy is solar-based, and I have no reason to doubt him. I'm hesitant to estimate the temperature of these rays, as I don't have enough data, but anecdotal evidence suggests that he can at least match the heat energy of a bolt of lightning, which can reach temperatures of up to 30,000 kelvins (53,540 degrees Fahrenheit).

Having carefully studied the natural attributes of my namesake, I've learned that many nocturnal mammals have reflective layers of tissue behind their retinas, allowing them to amplify available light. I imagine that Superman naturally has a variation of this retroreflector made of a kind of semisolid optical crystalline material, like the phosphate used in laser amplification. It's possible that the vitreous gel acts as a lasing medium. Light would enter through the pupil to this retroreflector and mirror through a series of lenses back to the iris. Stored solar energy could certainly be the key to the process. As the light builds strength through reflection and amplification, photons would be produced in the trillions, vibrating coherently with the same direction and frequency. A beam of tightly focused energy could be the result.

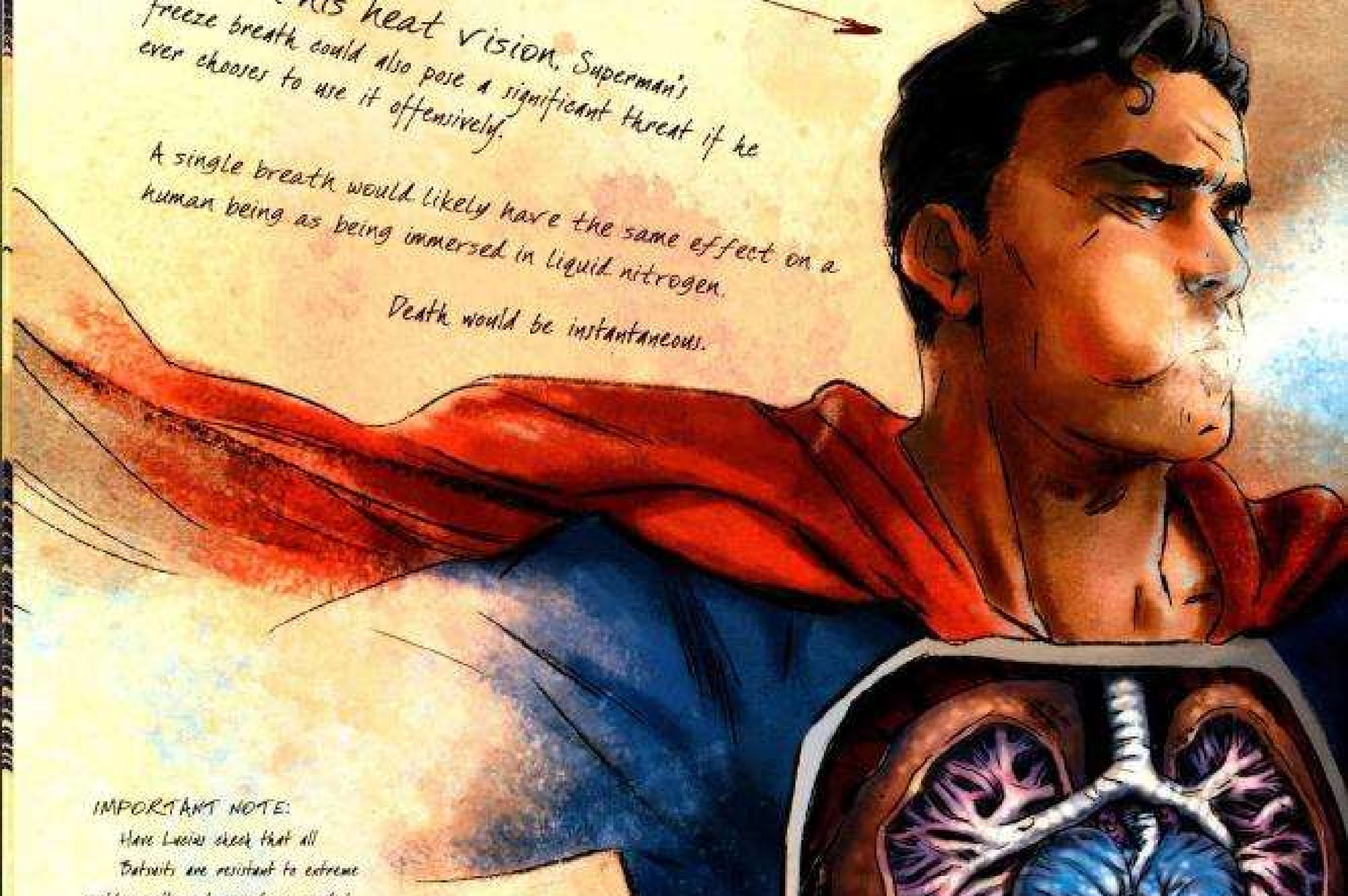

ALL MAMMALS HAVE THE CAPACITY FOR ENDOTHERMIC HEAT GENERATION.
Is it possible that Clark's abilities are an exponentially magnified version of this same effect routed through his optic system?
Perhaps Superman can store and release heat energy in the same way that an electric eel uses its Sach's organ to generate an electrical discharge?

I've seen Superman use his freeze breath to turn thousands of gallons of water into ice in seconds. How can he sustain the ability for any length of time unless his body is compressing the necessary gases even as he expels them?

As with his heat vision, Superman's freeze breath could also pose a significant threat if he ever chooses to use it offensively.

A single breath would likely have the same effect on a human being as being immersed in liquid nitrogen.

Death would be instantaneous.



IMPORTANT NOTE:
Have Lucius check that all Batsuits are resistant to extreme cold assaults and upgrade as needed. Develop cowl mouthguard for full protection? Carry out comparative study of Mr. Freeze and Killer Frost's abilities and how they stack up against Superman's freeze breath. (further information available in section on Killer Frost at end of this report).

Specialized respiratory organ? Or some other process, some system that I haven't yet imagined?

Pockets of freeze-chemical connected to his diaphragm, organic sacs of ammonia, or liquid nitrogen?

Must carry out further research into the limitations of this power. Just how large a body of water is Superman able to freeze? Rivers? Lakes? Entire oceans?

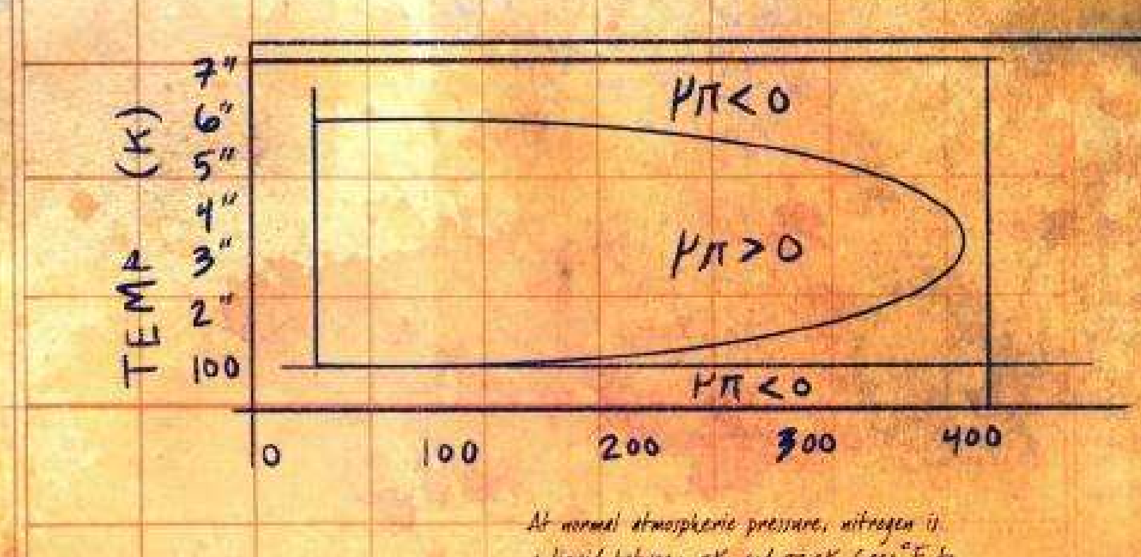
Freeze Breath

Superman can exhale subfreezing air. After witnessing his incredible lung capacity on a number of instances, I researched the science that might make that possible. The Joule-Thomson effect in thermodynamics describes the temperature change of a compressed and insulated gas or liquid when it is forced through a valve. At room temperature, all gases except hydrogen, helium, and neon cool rapidly upon expansion through this process.

Consider that Earth's atmosphere is primarily nitrogen and oxygen, and that Superman's respiratory system is an insulated system, his lips a valve. When he inhales, some as-yet undefined organic process in his chest compresses and concentrates these gases, superheating them. When he exhales, the heated and compressed air expands rapidly. The faster it expands, the faster it cools. Based on my own observations and video captured by bystanders, I estimate that he can compress air to at least 3,000 pounds per square inch.

For his body to support this effect, Superman's diaphragm would have to be collapsible, his viscera strong enough to be pushed aside, his pleura flexible, and his lung tissue elastic. Beyond that, his external intercostal muscles would have to be incredibly well developed to expel the compressed air with such force. Again, I'm not stating any of this as fact, but as my best guess based on collected data and my own observations.

While it's true that if Superman were to fall under the influence of a malevolent force his freeze breath could be misused, there's no denying it's a powerful tool for good. I've witnessed him use it to freeze entire tidal waves, saving thousands of lives in the process.



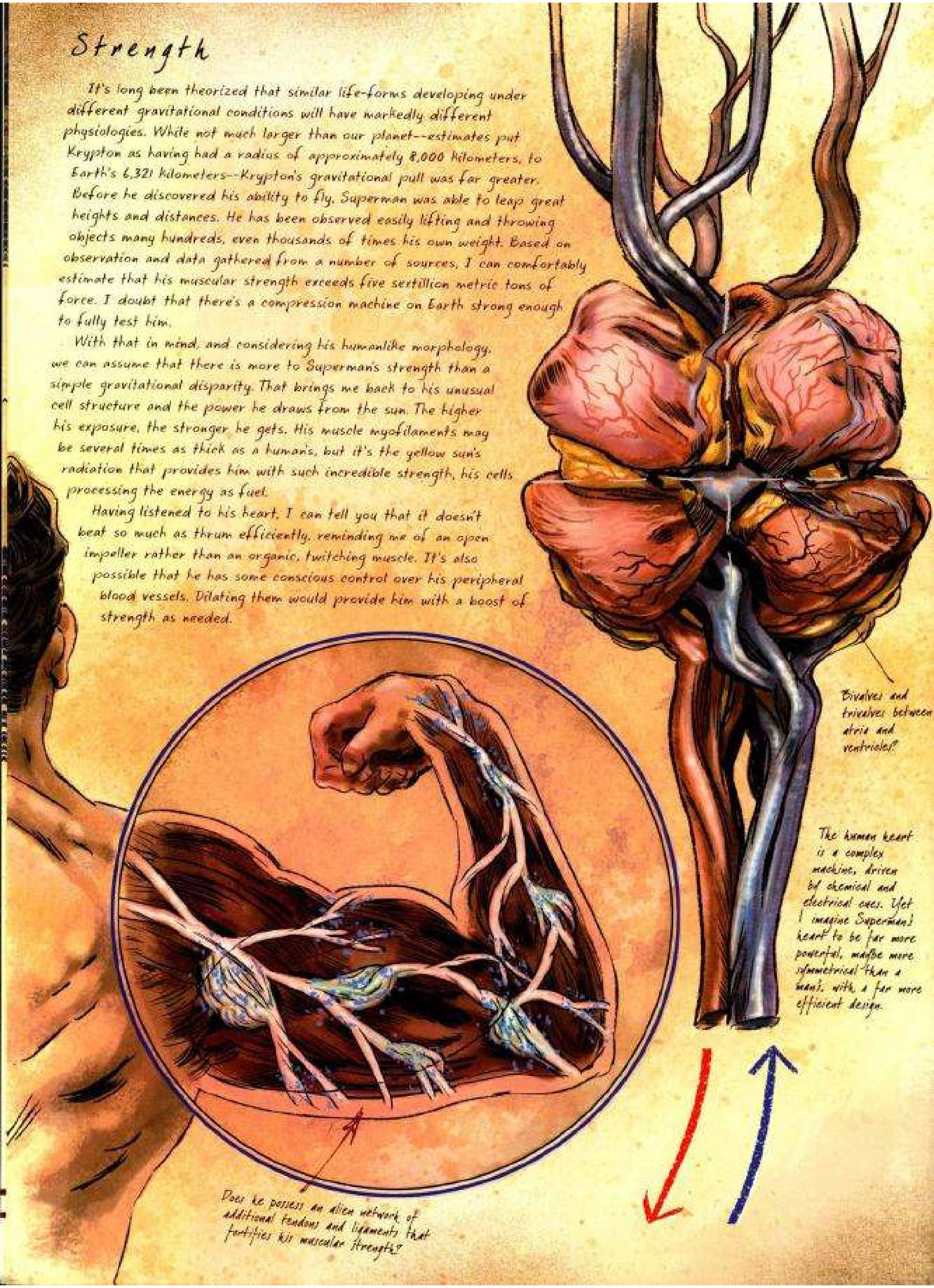
At normal atmospheric pressure, nitrogen is a liquid between 63K and 77.2K (-346°F to -321°F, or -210°C to -196°C).

Strength

It's long been theorized that similar life-forms developing under different gravitational conditions will have markedly different physiologies. While not much larger than our planet--estimates put Krypton as having had a radius of approximately 8,000 kilometers, to Earth's 6,321 kilometers--Krypton's gravitational pull was far greater. Before he discovered his ability to fly, Superman was able to leap great heights and distances. He has been observed easily lifting and throwing objects many hundreds, even thousands of times his own weight. Based on observation and data gathered from a number of sources, I can comfortably estimate that his muscular strength exceeds five sextillion metric tons of force. I doubt that there's a compression machine on Earth strong enough to fully test him.

With that in mind, and considering his humanlike morphology, we can assume that there is more to Superman's strength than a simple gravitational disparity. That brings me back to his unusual cell structure and the power he draws from the sun. The higher his exposure, the stronger he gets. His muscle myofilaments may be several times as thick as a human's, but it's the yellow sun's radiation that provides him with such incredible strength, his cells processing the energy as fuel.

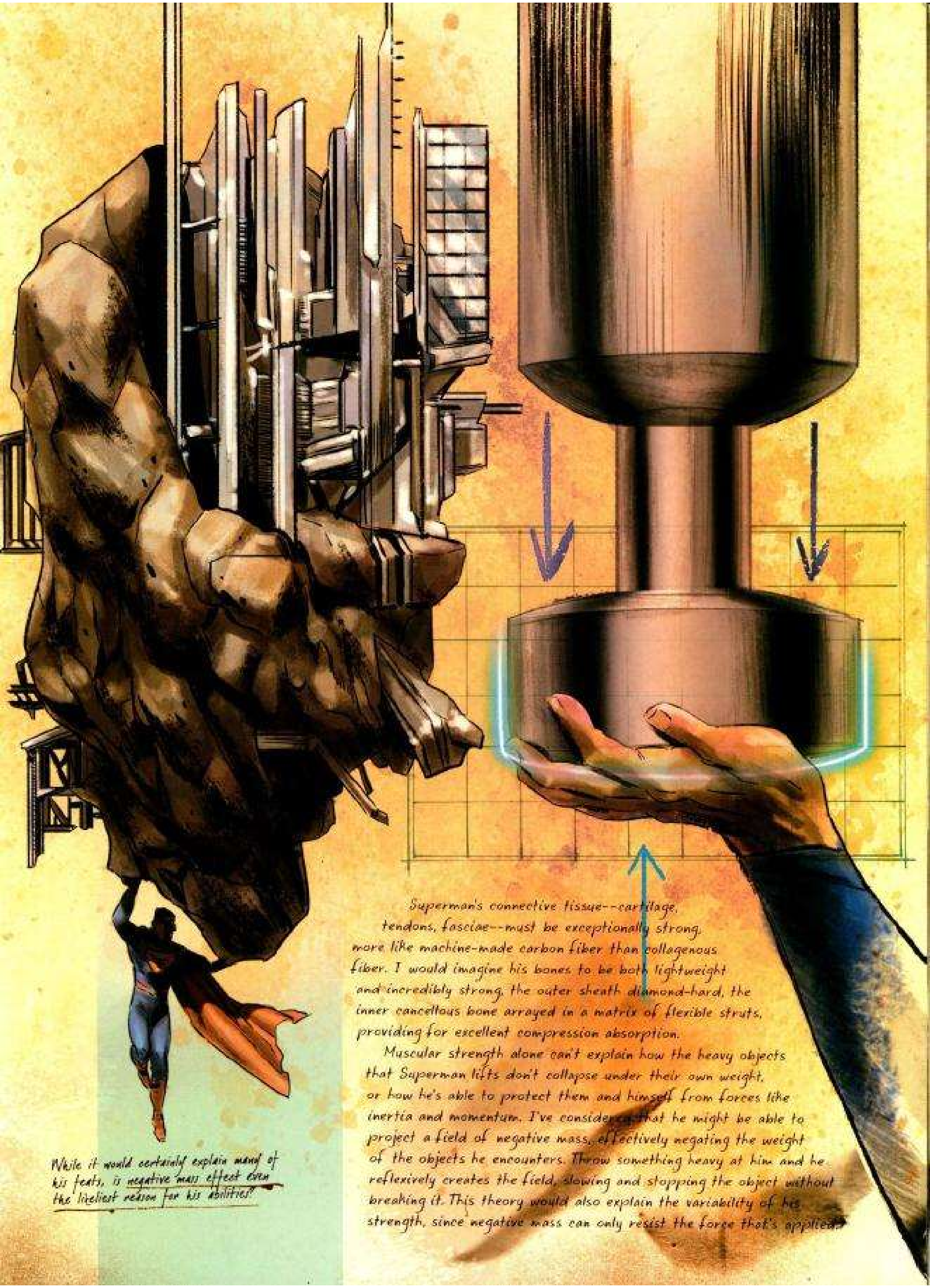
Having listened to his heart, I can tell you that it doesn't beat so much as thrum efficiently, reminding me of an open impeller rather than an organic, twitching muscle. It's also possible that he has some conscious control over his peripheral blood vessels. Dilating them would provide him with a boost of strength as needed.



Bivalves and trivalves between atria and ventricles?

The human heart is a complex machine, driven by chemical and electrical cues. Yet I imagine Superman's heart to be far more powerful, maybe more symmetrical than a man's, with a far more efficient design.

Does he possess an alien network of additional tendons and ligaments that fortifies his muscular strength?



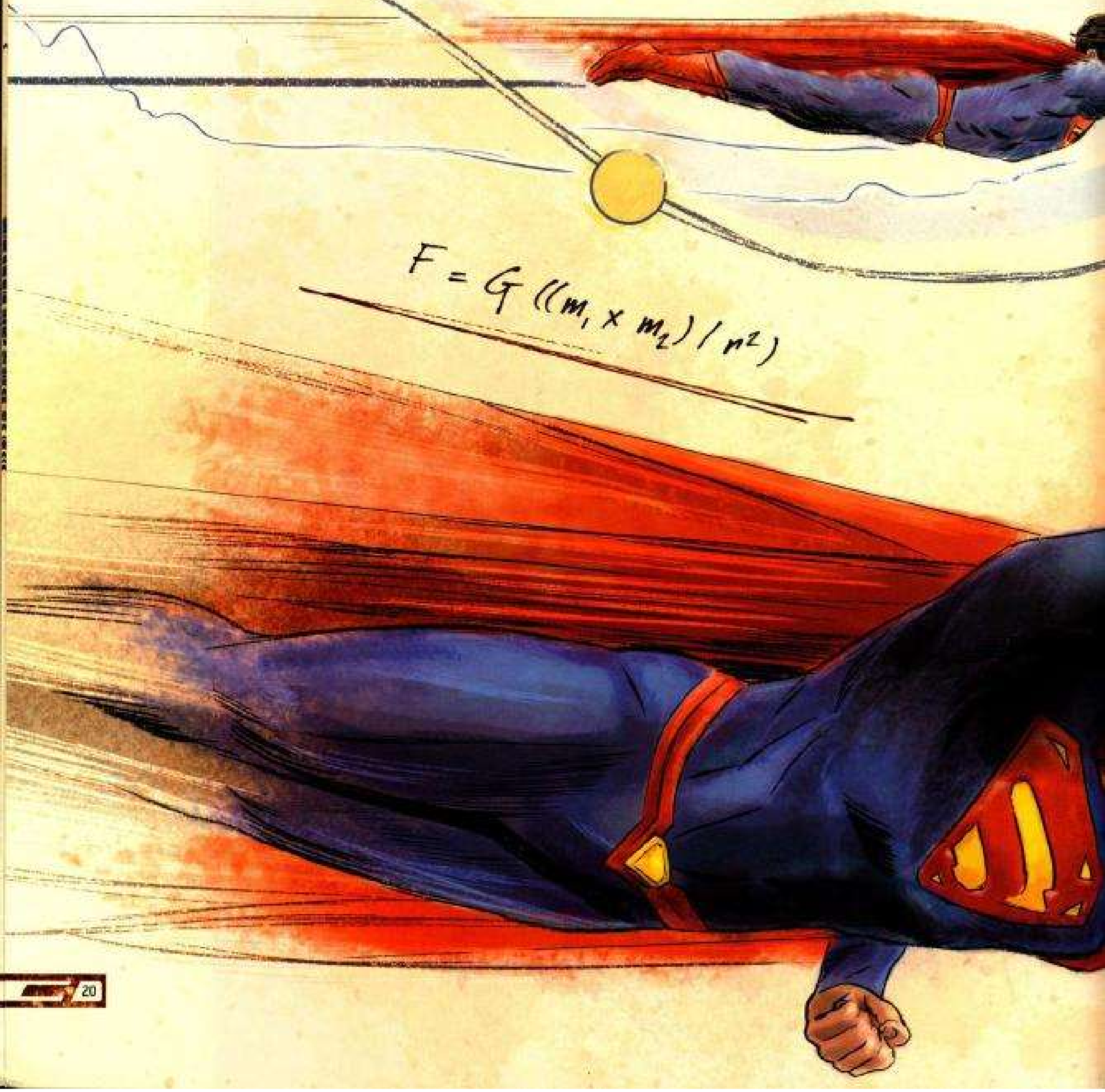
Superman's connective tissue--cartilage, tendons, fasciae--must be exceptionally strong, more like machine-made carbon fiber than collagenous fiber. I would imagine his bones to be both lightweight and incredibly strong, the outer sheath diamond-hard, the inner cancellous bone arrayed in a matrix of flexible struts, providing for excellent compression absorption.

Muscular strength alone can't explain how the heavy objects that Superman lifts don't collapse under their own weight, or how he's able to protect them and himself from forces like inertia and momentum. I've considered that he might be able to project a field of negative mass, effectively negating the weight of the objects he encounters. Throw something heavy at him and he reflexively creates the field, slowing and stopping the object without breaking it. This theory would also explain the variability of his strength, since negative mass can only resist the force that's applied.

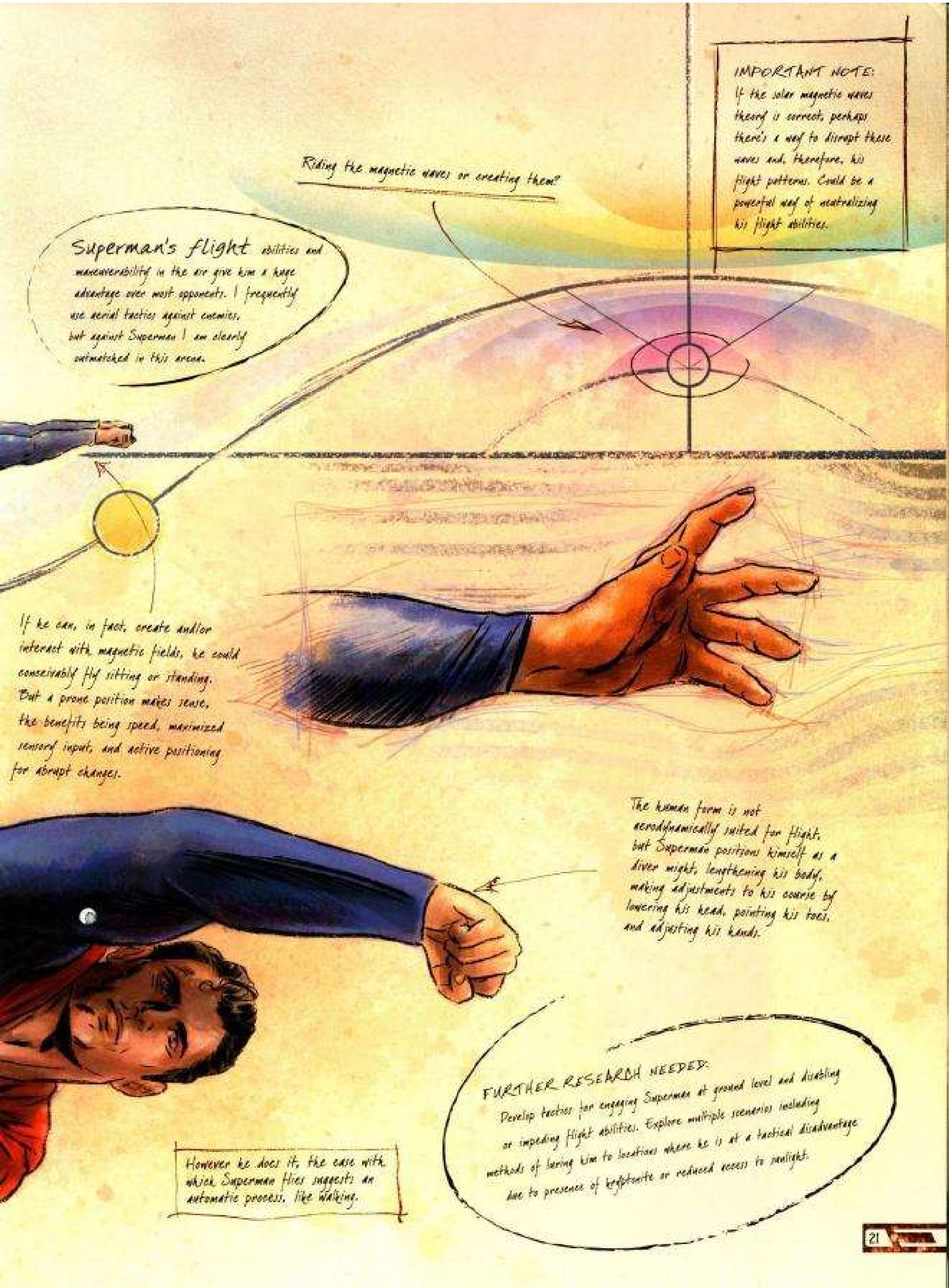
While it would certainly explain many of
his feats, is negative mass effect even
the likeliest reason for his abilities?

Flight

Considering his nearly limitless energy supply, Superman could be able to internally generate varying amounts of electricity, which could, in turn, react to Earth's magnetic fields. This electromagnetic induction--riding and interacting with waves of electromagnetic energy--could certainly be considered flight. Our galaxy is alive with powerful solar magnetic waves, perhaps explaining how he can travel through space. Again, his solar "batteries" would need to interact with natural radiation, carrying him effortlessly through the airless void. Assuming that his cells do convert light to fuel, he wouldn't need to breathe for extended periods, just as he doesn't need to eat to maintain his health. The idea of negative mass fields could provide an alternative explanation for his ability to fly, especially if paired with some kind of organic telekinetic ability. Perhaps he wills himself toward an object and is propelled toward it, giving the impression of flight. This isn't an avenue I've explored in any depth--it doesn't seem likely--but it's important to keep an open mind.



$$F = G\,((m_1 \times m_2) / r^2)$$



IMPORTANT NOTE:
If the solar magnetic waves theory is correct, perhaps there's a way to disrupt these waves and, therefore, his flight patterns. Could be a powerful way of neutralizing his flight abilities.

Riding the magnetic waves or creating them?

Superman's flight abilities and maneuverability in the air give him a huge advantage over most opponents. I frequently use aerial tactics against enemies, but against Superman I am clearly outmatched in this arena.

If he can, in fact, create and/or interact with magnetic fields, he could conceivably fly sitting or standing. But a prone position makes sense, the benefits being speed, maximized sensory input, and active positioning for abrupt changes.

The human form is not aerodynamically suited for flight, but Superman positions himself as a diver might, lengthening his body, making adjustments to his course by lowering his head, pointing his toes, and adjusting his hands.

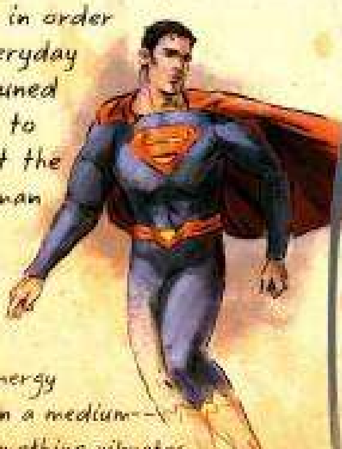
FURTHER RESEARCH NEEDED:
Develop tactics for engaging Superman at ground level and disabling or impeding flight abilities. Explore multiple scenarios including methods of luring him to locations where he is at a tactical disadvantage due to presence of kryptonite or reduced access to sunlight.

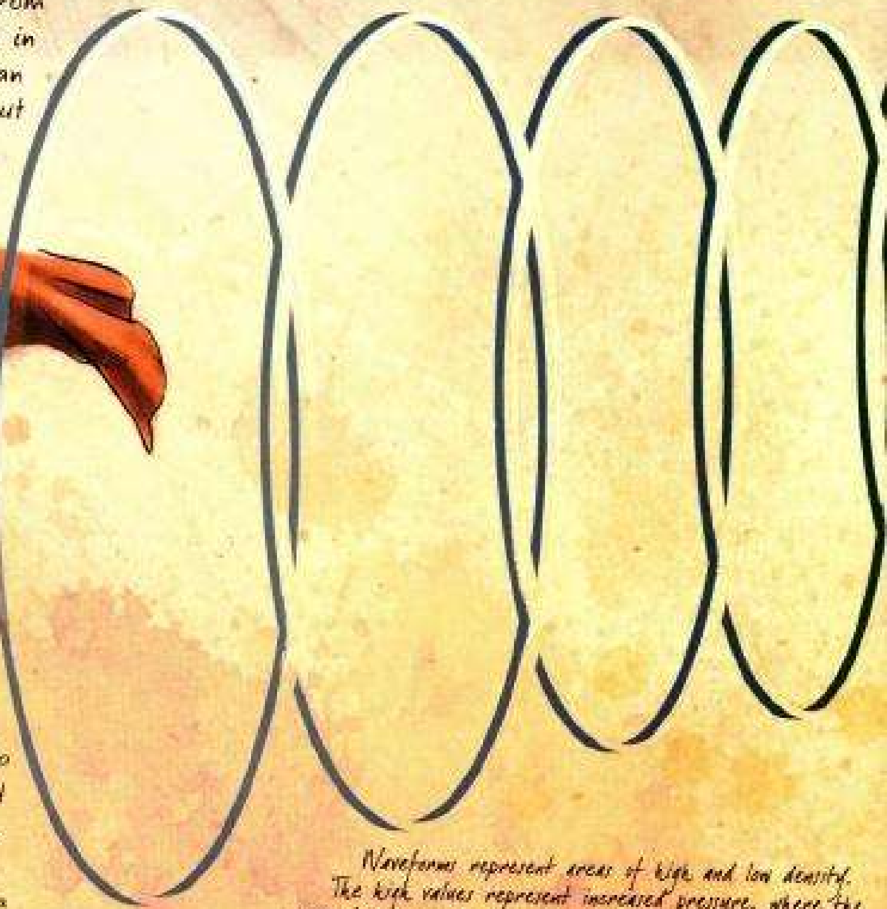
However he does it, the ease with which Superman flies suggests an automatic process, like walking.

Super-Hearing

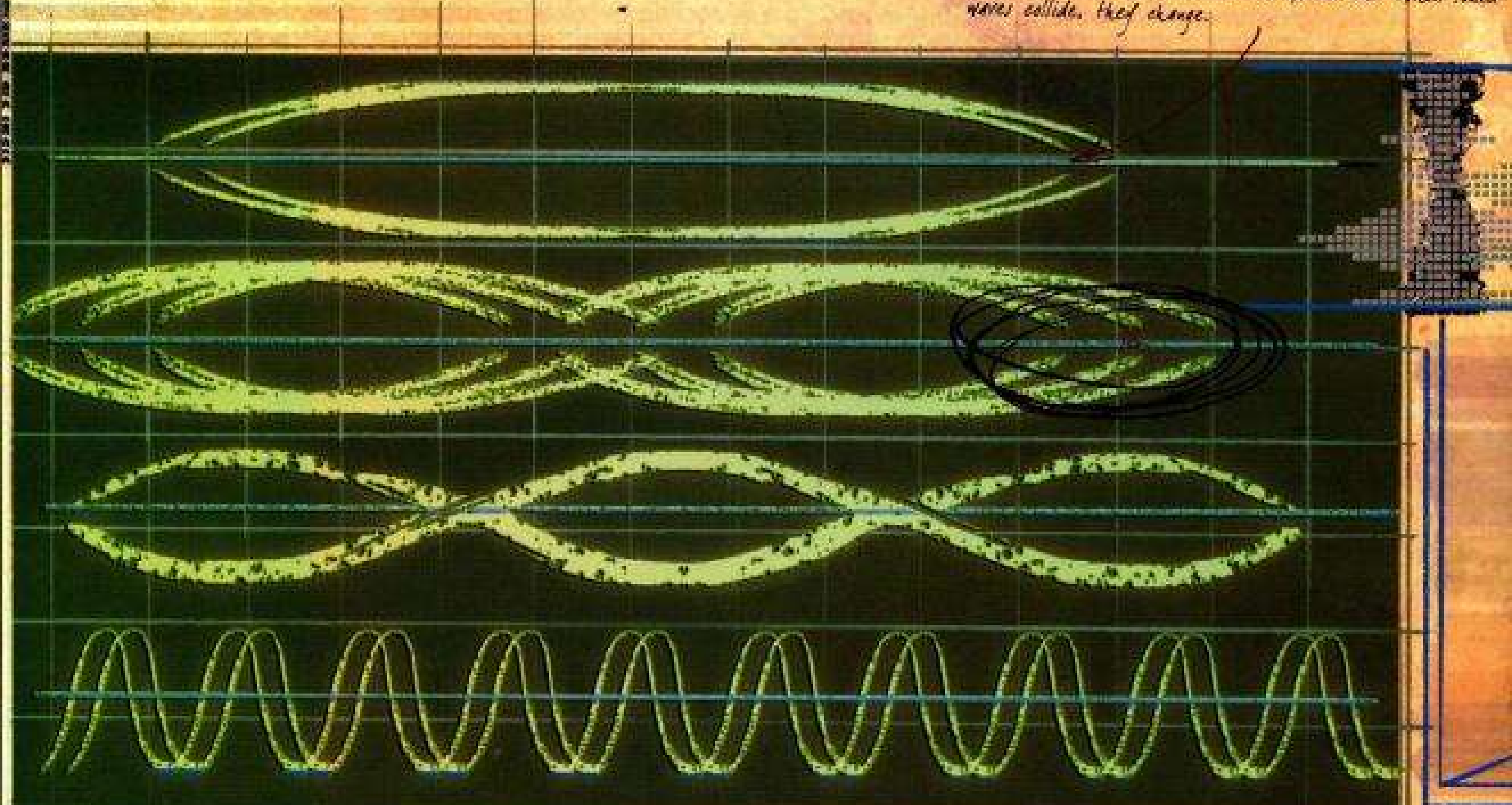
Superman can hear sounds that humans can't, from infrasonic to ultrasonic, over far distances and in considerably more detail than a human being can perceive. Clark has trained himself to screen out or block most noises in order to function in the everyday world and has fine-tuned his listening process to be able to single out the beat of a single human heart at a distance of miles, or pick out a conversation from across a city.

Sound is a form of energy produced by vibrations in a medium--air, gas, water. When something vibrates, it pushes the air molecules next to it, compressing them into waves of pressure. Energy is transferred from molecule to molecule until the energy is exhausted. Our ears and auditory systems collect, amplify, and transduce the sounds into electrical impulses that the brain uses to perceive and localize sounds. Sound frequency is measured in hertz, which is how frequently the sound-producer vibrates. An object that vibrates once per second would have a frequency of 1 hertz.

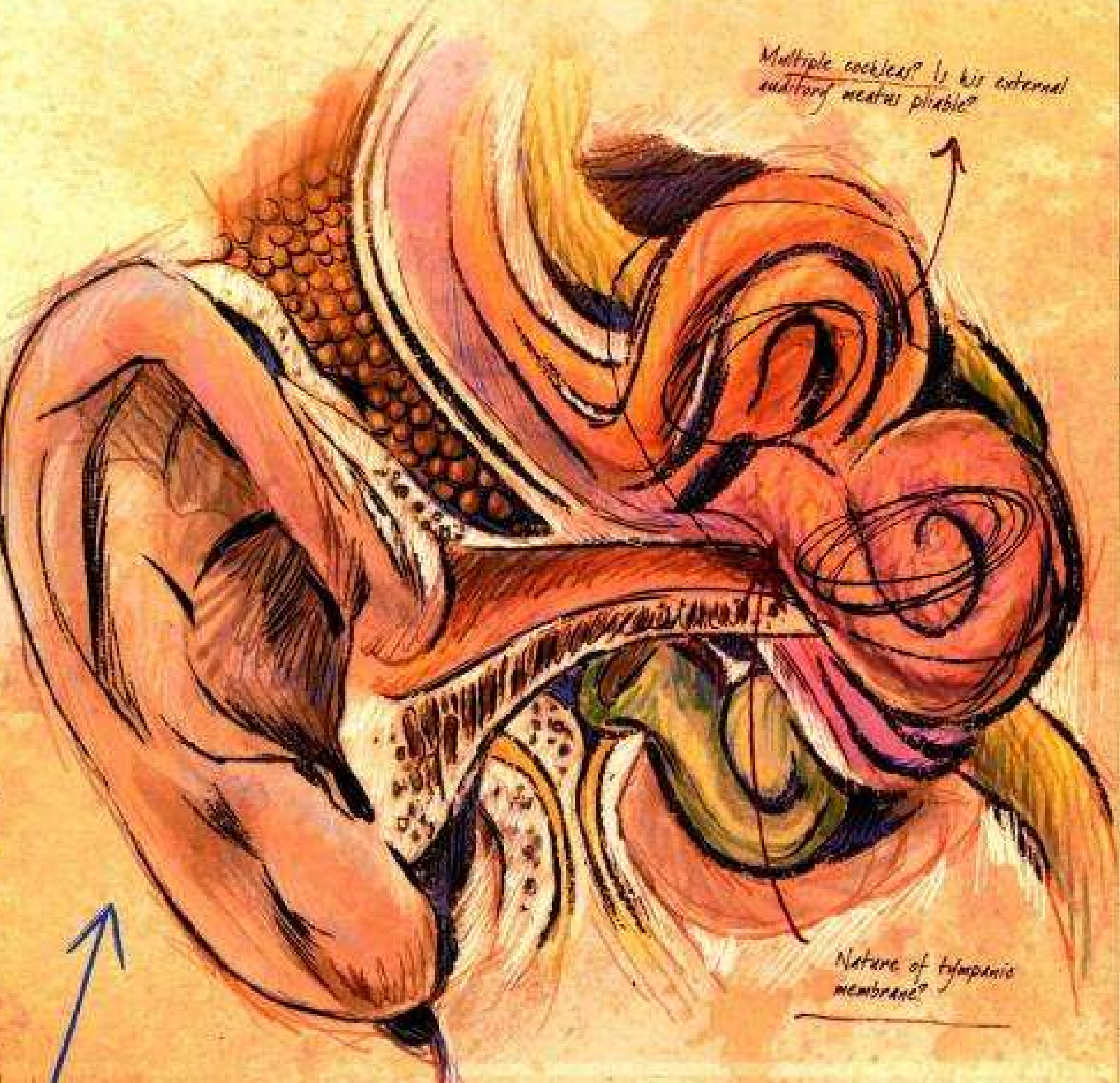




Waveforms represent areas of high and low density. The high values represent increased pressure, where the vibrating air molecules are more densely packed together; at the low end, the molecules are spread out. When sound waves collide, they change.



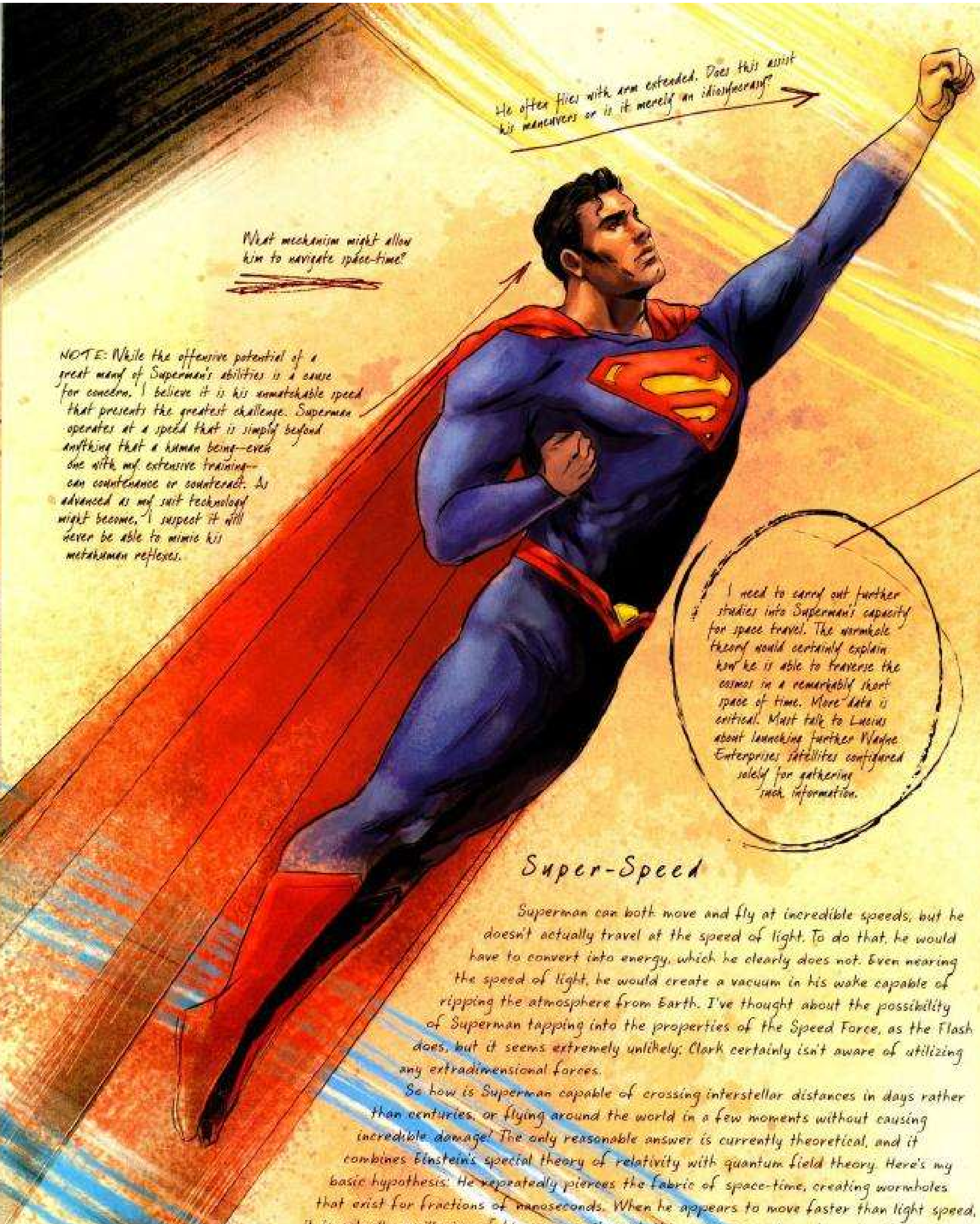
Sound waves are measured by length, amplitude (represented by waveform height), and frequency.


Multiple cochleas? Is his external auditory meatus pliable?
Nature of tympanic membrane?

Superman seems to be able to compartmentalize each individual sound he hears, effectively negating wave interference. How is this possible?

Generally, human hearing ranges from 20 Hz to 20,000 hertz. On Earth, some migratory birds can hear sounds as low as 0.1 hertz, allowing them to receive the infrasonic sound of ocean waves breaking along a coastline, aiding them in navigation. There's a kind of moth that can hear up to 240,000 hertz, so it can avoid being eaten by echolocating bats. I calibrated a special audiometer to test to these ranges, and Clark's hearing is off the chart in both directions.

Part of the reason he hears so well is no doubt related to ear structure. His outer ears appear human but the middle and inner anatomy must be quite different. I'm guessing they have an unusual configuration of passages and bones and exceptionally sensitive membranes. Sound travels better through solids than through fluids, so it's possible that his cochlea (the organ in each ear that translates sound into data for the brain) is filled with matter far denser than the human equivalent. But there's more going on here than simple anatomy. How can he pick up sounds at such great distances? How can he direct this sense to localize, to seek out and differentiate specific vibrations? I started to theorize a complementary auditory sense that can somehow interpret echoes of longitudinal sound waves, perhaps through cues in air density, but there's no actual data to support this line of reasoning. Needless to say, studies are ongoing.



He often flies with arm extended. Does this assist his maneuvers or is it merely an idiosyncrasy?

What mechanism might allow him to navigate space-time?

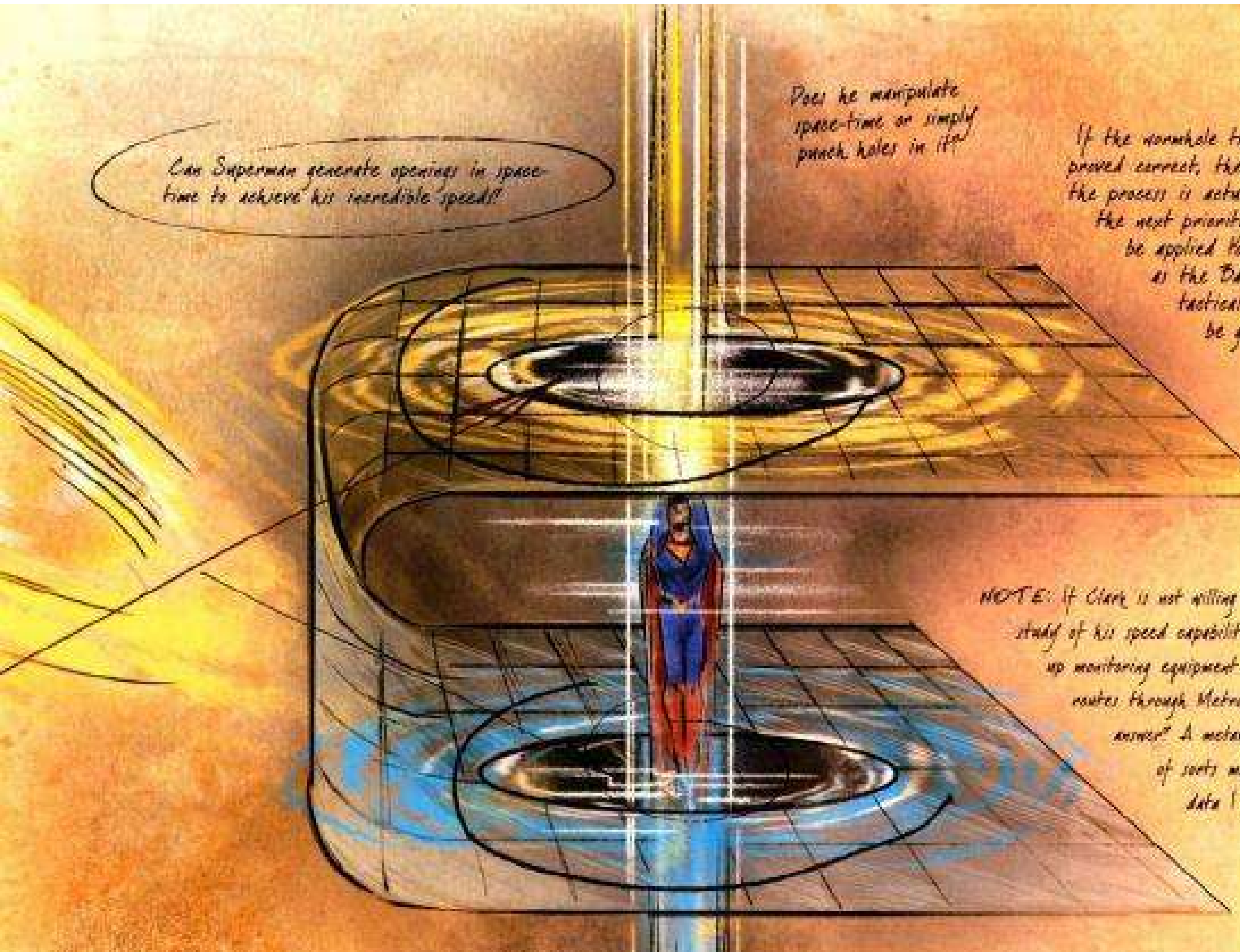
NOTE: While the offensive potential of a great many of Superman's abilities is a cause for concern, I believe it is his unmatchable speed that presents the greatest challenge. Superman operates at a speed that is simply beyond anything that a human being--even one with my extensive training--can countenance or counteract. As advanced as my suit technology might become, I suspect it will never be able to mimic his metahuman reflexes.

I need to carry out further studies into Superman's capacity for space travel. The wormhole theory would certainly explain how he is able to traverse the cosmos in a remarkably short space of time. More data is critical. Must talk to Lucius about launching further Wayne Enterprises satellites configured solely for gathering such information.

Super-Speed

Superman can both move and fly at incredible speeds, but he doesn't actually travel at the speed of light. To do that, he would have to convert into energy, which he clearly does not. Even nearing the speed of light, he would create a vacuum in his wake capable of ripping the atmosphere from Earth. I've thought about the possibility of Superman tapping into the properties of the Speed Force, as the Flash does, but it seems extremely unlikely; Clark certainly isn't aware of utilizing any extradimensional forces.

So how is Superman capable of crossing interstellar distances in days rather than centuries, or flying around the world in a few moments without causing incredible damage? The only reasonable answer is currently theoretical, and it combines Einstein's special theory of relativity with quantum field theory. Here's my basic hypothesis: He repeatedly pierces the fabric of space-time, creating wormholes that exist for fractions of nanoseconds. When he appears to move faster than light speed, it is actually an illusion of his passage through this pulsing quantum channel, gaining speed as he halves distances in Planck time--theoretically, the smallest measurement of time that will ever be possible. Because he moves so quickly, he doesn't disappear as he travels, for the



Can Superman generate openings in space-time to achieve his incredible speeds?

Does he manipulate space-time or simply punch holes in it?

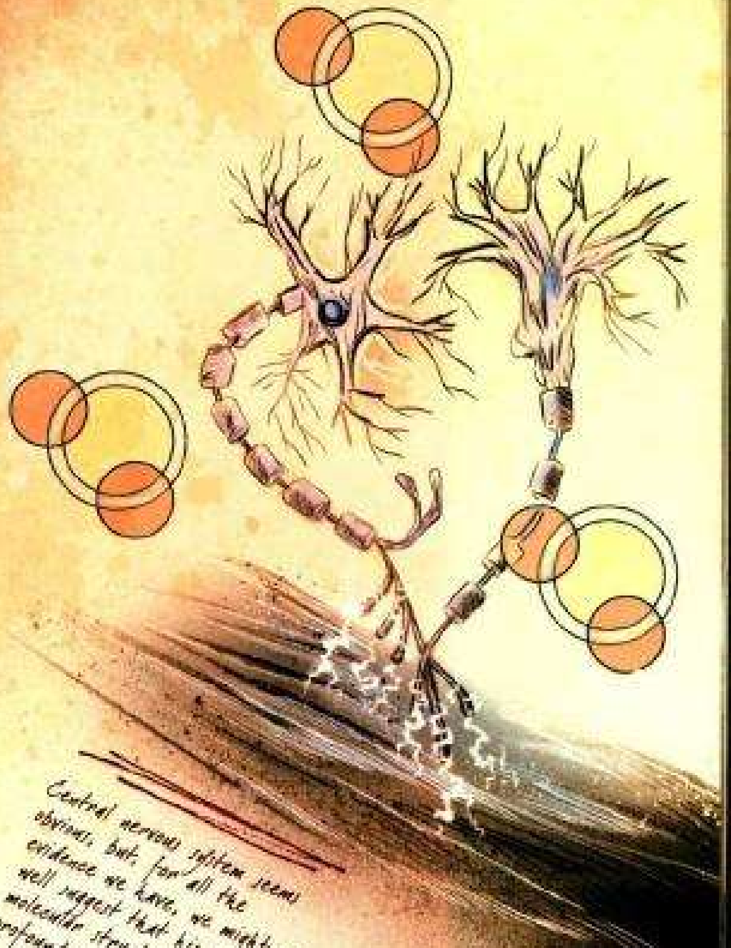
If the wormhole theorem could be proved correct, then discovering how the process is actuated would be the next priority. If it could be applied to vehicles such as the Batwing, then the tactical advantages would be game-changing.

NOTE: If Clark is not willing to take part in a study of his speed capabilities, perhaps setting up monitoring equipment along his known routes through Metropolis would be the answer? A metahuman "speed trap" of sorts may provide the data I need.

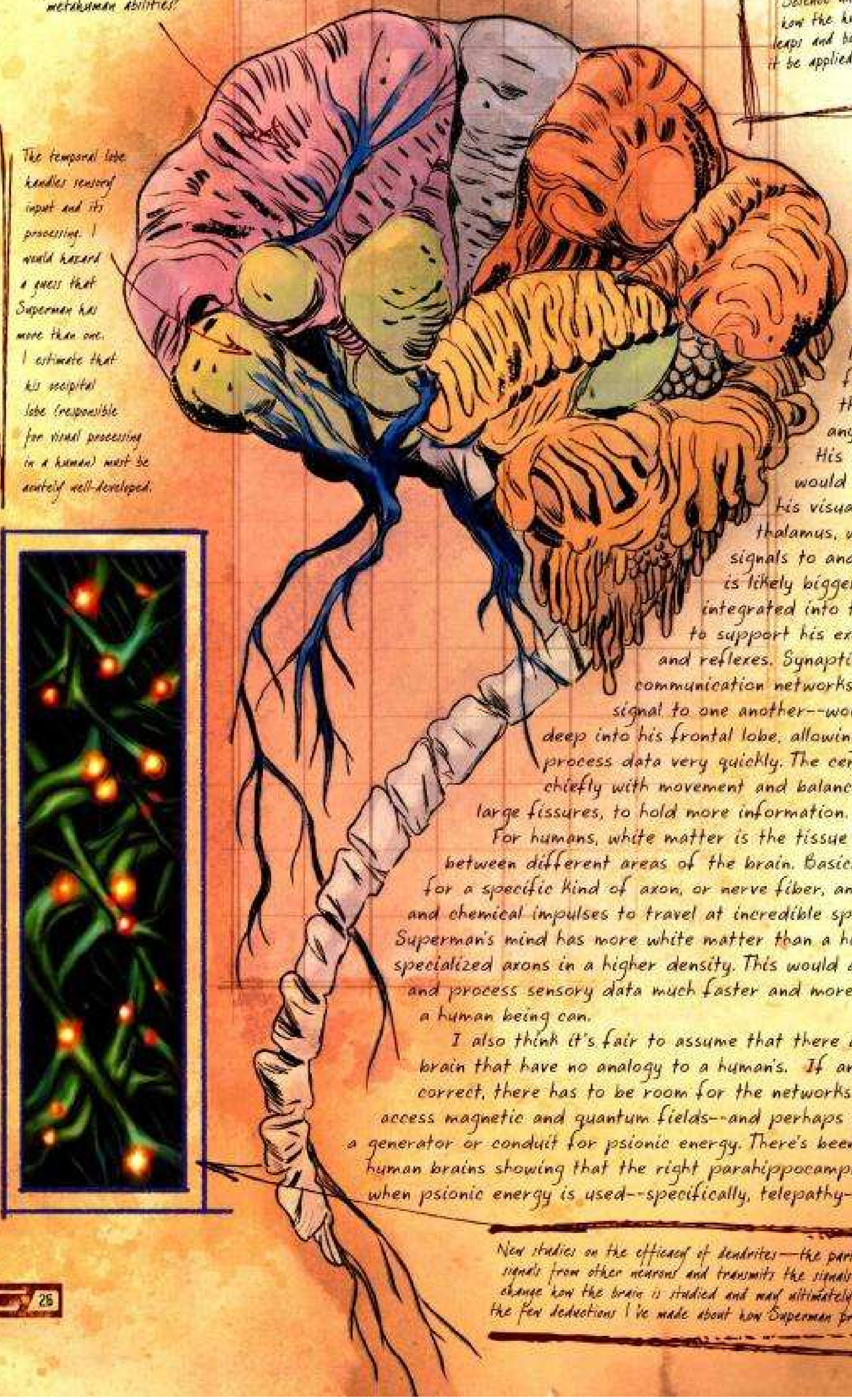
There's no way to measure any adverse effects his super-speed travel may present to the environments he passes through. While there's no evidence that there are any such negative effects, not enough is understood about the way he seems to trespass upon Earth's immutable laws of physics.

same reason our eyes don't see the flickering of an old movie, a series of still images. This would also explain how he is able to move so fast without creating turbulence.

His reflexes match his speed, which suggests an incredibly well-developed central nervous system in addition to quantum access abilities--but considering how fast he is, it's possible that his motor, sensory, and relay neurons may be at least partly accentuated by some kind of organic systemic telekinesis. Rather than wait for a synaptic transmission--a chemical message from his brain to the rest of his body--his exceptional senses could transmit the information directly to the muscle fibers, literally allowing him to move before he even has to think about moving. It's just a theory; at this point there's no evidence to support it.



Central nervous system seems obvious, but, for all the evidence we have, we might as well suggest that his actual molecular structure invites these profound environmental changes.



The frontal lobe is associated with both motor function and higher learning processes. Could Superman have additional specialized areas within his frontal lobe responsible for his physical metahuman abilities?

Science unveils new truths about how the human brain functions in leaps and bounds, but can any of it be applied to this Kryptonian?

The temporal lobe handles sensory input and its processing. I would hazard a guess that Superman has more than one. I estimate that his occipital lobe (responsible for visual processing in a human) must be acutely well-developed.

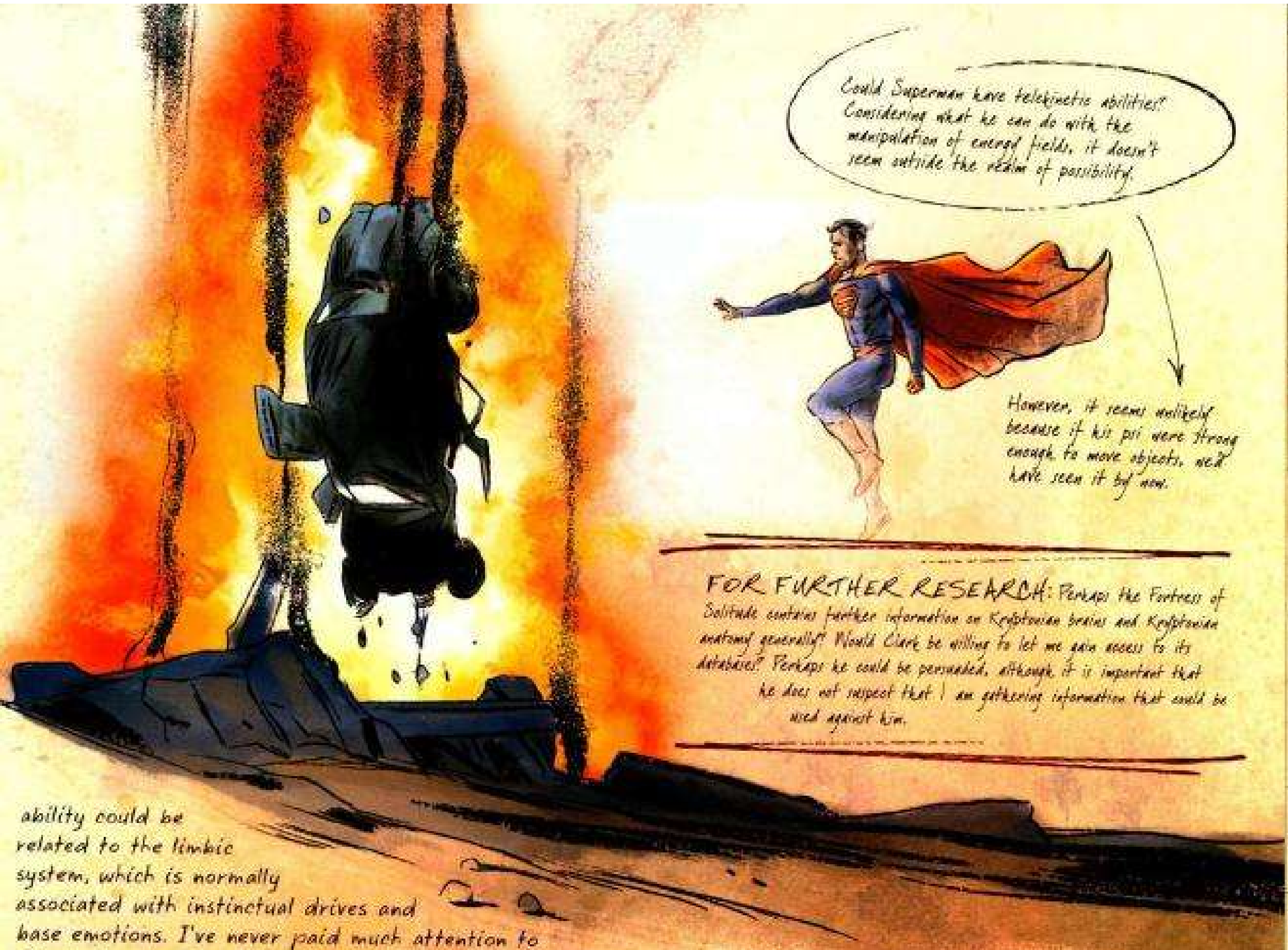
The Brain

Superman's mind must have a functional layout very different from ours, assuming that his brain is anything like a human's. His occipital cortex would be larger, to support his visual capabilities. The thalamus, which relays sensory signals to and from the brain, is likely bigger and more fully integrated into the cerebrum in order to support his exceptional senses and reflexes. Synaptic matrixes--chemical communication networks by which neurons signal to one another--would need to extend deep into his frontal lobe, allowing him to access and process data very quickly. The cerebellum, which deals chiefly with movement and balance, would have multiple large fissures, to hold more information.

For humans, white matter is the tissue that passes messages between different areas of the brain. Basically, it's the insulation for a specific kind of axon, or nerve fiber, and allows electrical and chemical impulses to travel at incredible speeds. I believe that Superman's mind has more white matter than a human's, more of these specialized axons in a higher density. This would allow him to assimilate and process sensory data much faster and more comprehensively than a human being can.

I also think it's fair to assume that there are parts of his brain that have no analogy to a human's. If any of my theories are correct, there has to be room for the networks that allow him to access magnetic and quantum fields--and perhaps an area that works as a generator or conduit for psionic energy. There's been some research into human brains showing that the right parahippocampal gyrus is activated when psionic energy is used--specifically, telepathy--suggesting that this

New studies on the efficacy of dendrites—the part of a neuron that receives signals from other neurons and transmits the signals to the cell body—will change how the brain is studied and may ultimately require me to reconsider the few deductions I've made about how Superman processes information.

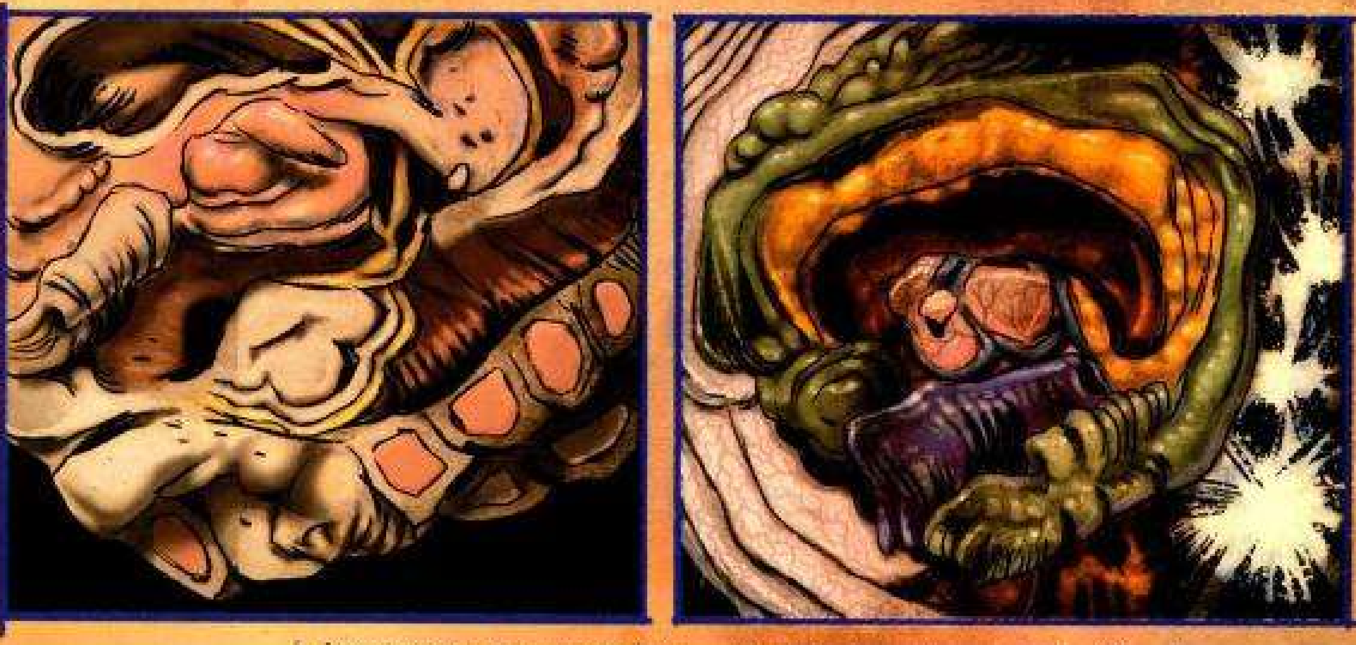


Could Superman have telekinetic abilities? Considering what he can do with the manipulation of energy fields, it doesn't seem outside the realm of possibility.

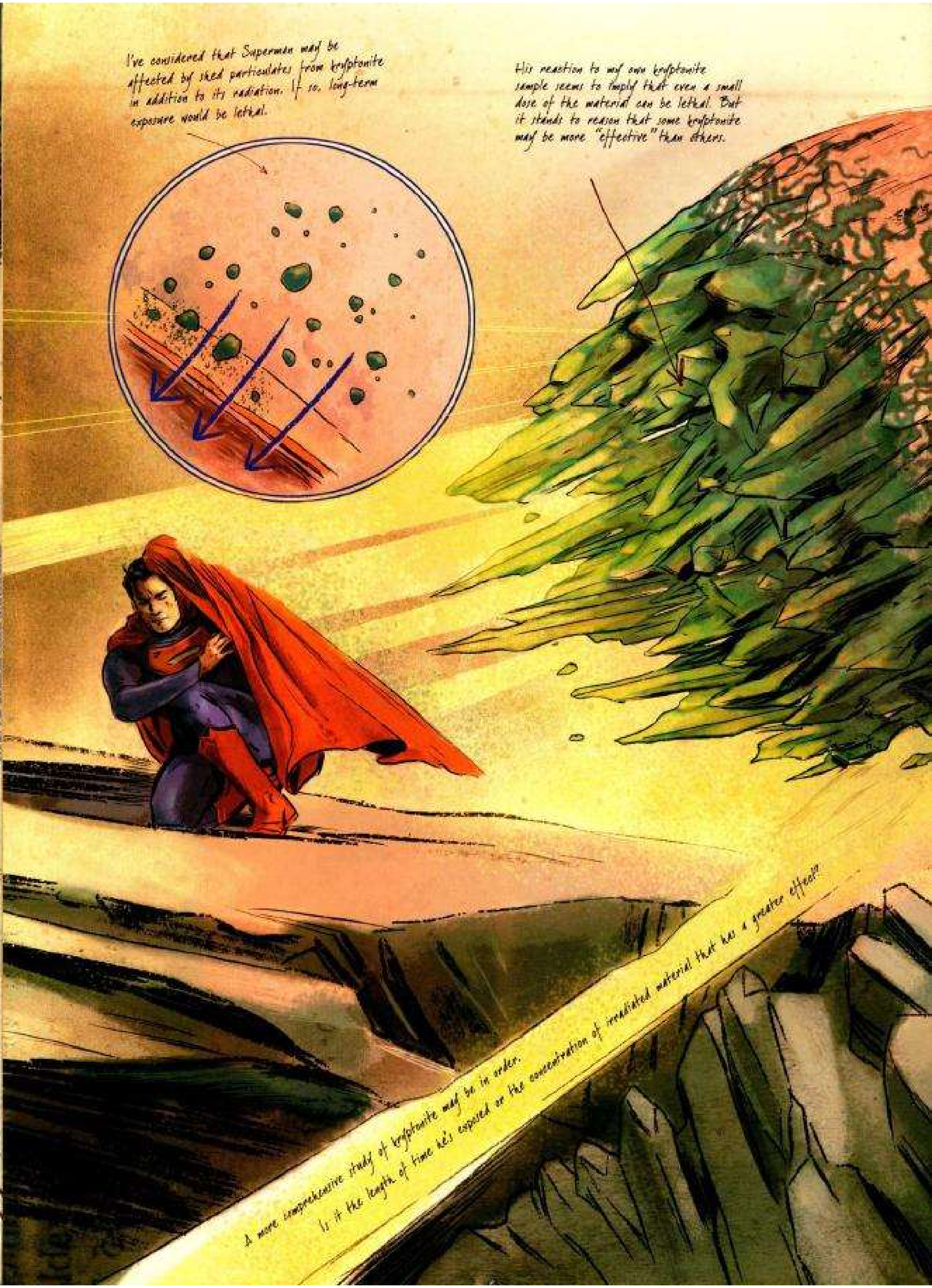
However, it seems unlikely because if his psi were strong enough to move objects, we'd have seen it by now.

FOR FURTHER RESEARCH: Perhaps the Fortress of Solitude contains further information on Kryptonian brains and Kryptonian anatomy generally? Would Clark be willing to let me gain access to its databases? Perhaps he could be persuaded, although it is important that he does not suspect that I am gathering information that could be used against him.

ability could be related to the limbic system, which is normally associated with instinctual drives and base emotions. I've never paid much attention to Jung's theories about a collective unconscious, but we have allies who cite it as one source of their own telepathic powers. Since I'm not able to verify that Clark is actually using psionics, this information doesn't currently have any practical use. Since MRI machines tend not to work around him, I'll keep working on imaging possibilities. But until we get a better look inside his head, this is all speculation.



Is Superman's brain like a human's in form, with additional processing areas and a different neurochemistry? Or is it so fundamentally alien that it can only be described by analogy?



I've considered that Superman may be affected by shed particulates from kryptonite in addition to its radiation. If so, long-term exposure would be lethal.

His reaction to my own kryptonite sample seems to imply that even a small dose of the material can be lethal. But it stands to reason that some kryptonite may be more "effective" than others.

A more comprehensive study of kryptonite may be in order.

Is it the length of time he's exposed or the concentration of irradiated material that has a greater effect?

Weaknesses

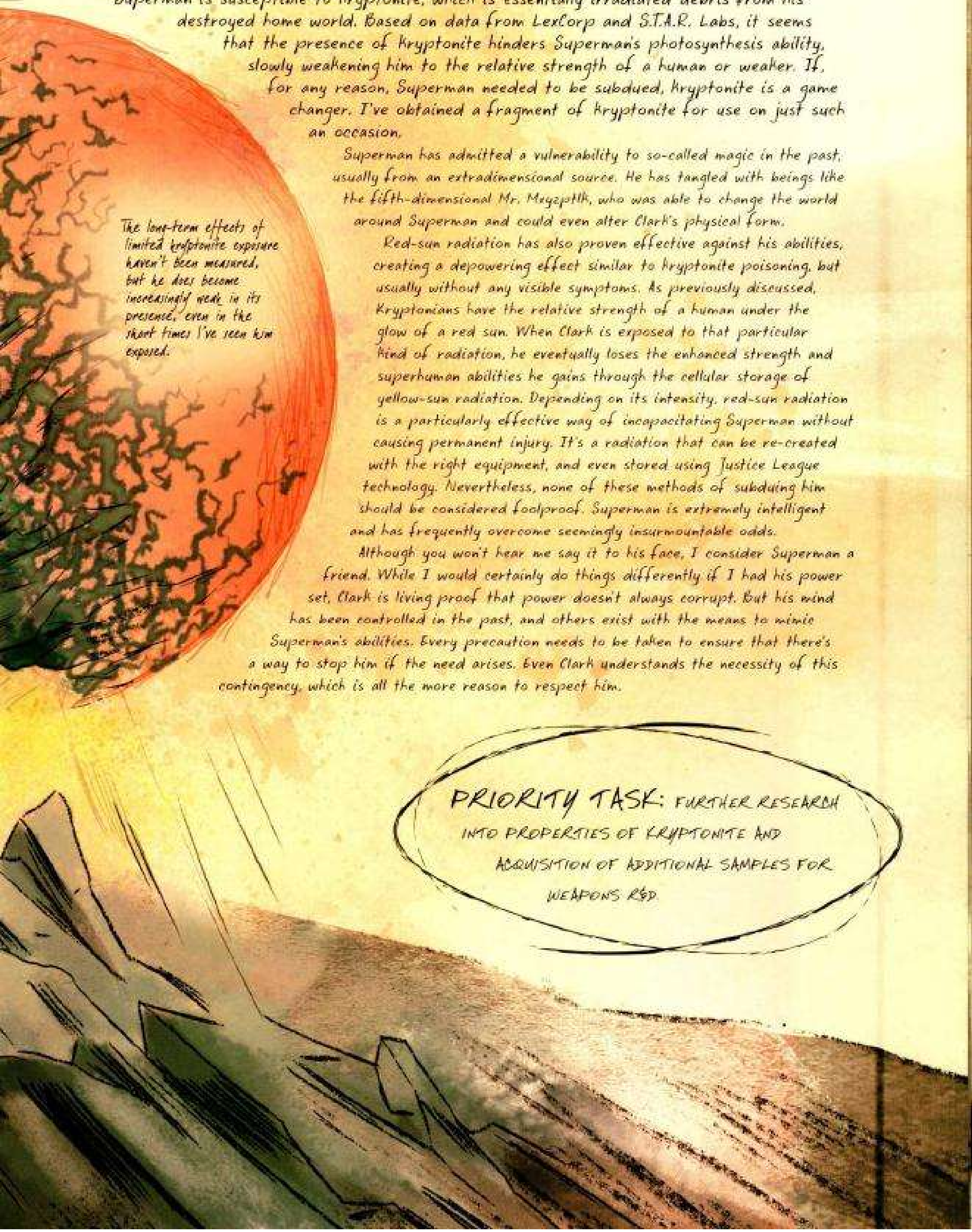
Superman is susceptible to kryptonite, which is essentially irradiated debris from his destroyed home world. Based on data from LexCorp and S.T.A.R. Labs, it seems that the presence of kryptonite hinders Superman's photosynthesis ability, slowly weakening him to the relative strength of a human or weaker. If, for any reason, Superman needed to be subdued, kryptonite is a game changer. I've obtained a fragment of kryptonite for use on just such an occasion.

Superman has admitted a vulnerability to so-called magic in the past, usually from an extradimensional source. He has tangled with beings like the fifth-dimensional Mr. Mxyzptlk, who was able to change the world around Superman and could even alter Clark's physical form.

Red-sun radiation has also proven effective against his abilities, creating a depowering effect similar to kryptonite poisoning, but usually without any visible symptoms. As previously discussed, Kryptonians have the relative strength of a human under the glow of a red sun. When Clark is exposed to that particular kind of radiation, he eventually loses the enhanced strength and superhuman abilities he gains through the cellular storage of yellow-sun radiation. Depending on its intensity, red-sun radiation is a particularly effective way of incapacitating Superman without causing permanent injury. It's a radiation that can be re-created with the right equipment, and even stored using Justice League technology. Nevertheless, none of these methods of subduing him should be considered foolproof. Superman is extremely intelligent and has frequently overcome seemingly insurmountable odds.

Although you won't hear me say it to his face, I consider Superman a friend. While I would certainly do things differently if I had his power set, Clark is living proof that power doesn't always corrupt. But his mind has been controlled in the past, and others exist with the means to mimic Superman's abilities. Every precaution needs to be taken to ensure that there's a way to stop him if the need arises. Even Clark understands the necessity of this contingency, which is all the more reason to respect him.

The long-term effects of limited kryptonite exposure haven't been measured, but he does become increasingly weak in its presence, even in the short times I've seen him exposed.



PRIORITY TASK: FURTHER RESEARCH INTO PROPERTIES OF KRYPTONITE AND ACQUISITION OF ADDITIONAL SAMPLES FOR WEAPONS R&D.

THE CHEETAH

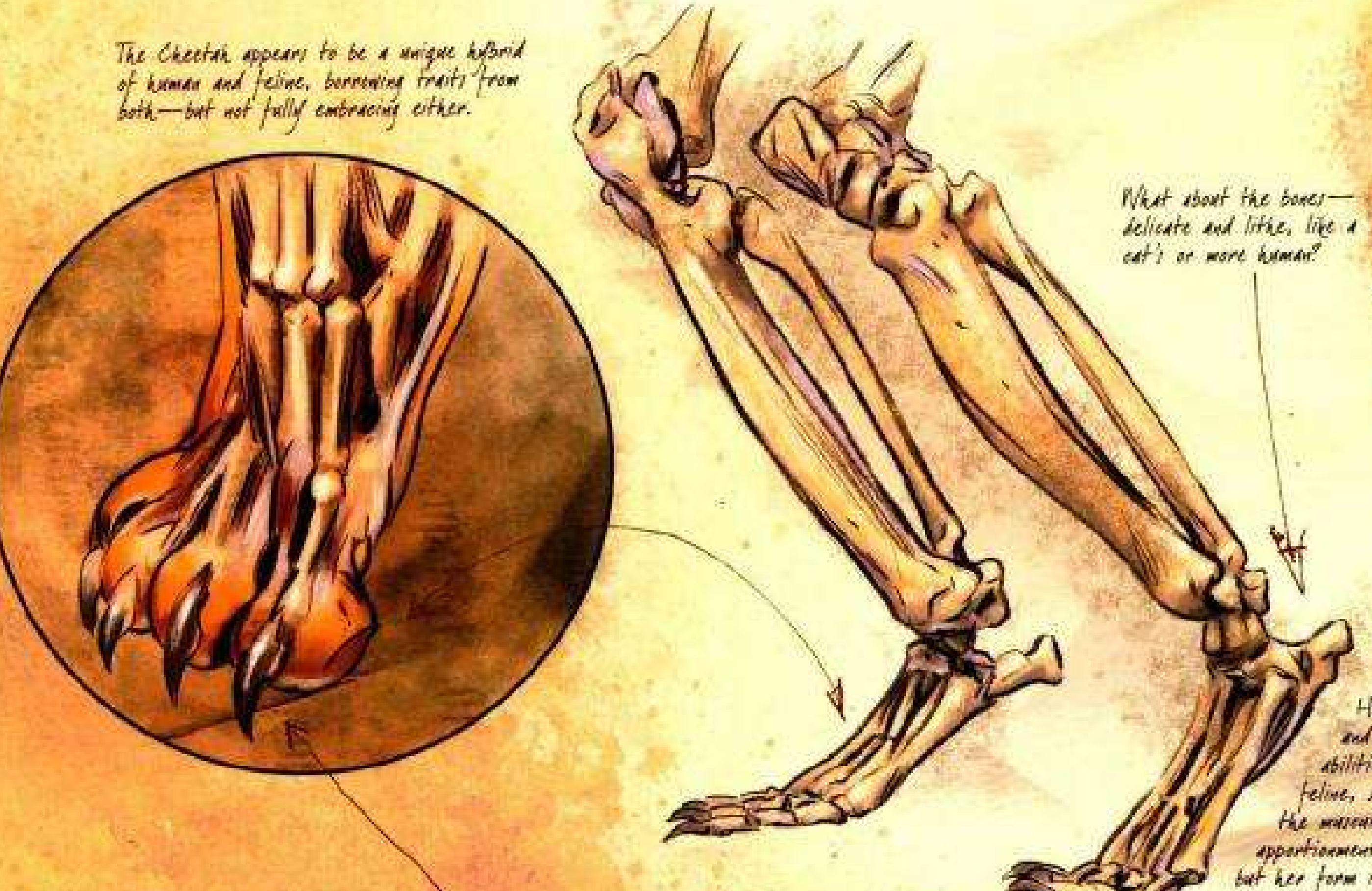
Years ago, Wonder Woman became friends with Barbara Ann Minerva, one of the first humans she met after traveling from Themyscira to our civilization. For a long time, we believed Minerva to be a con artist who had assumed several identities over the years and positioned herself as Diana's close ally through deception. However, as is usually the case when dealing with the so-called supernatural, things are often not as they appear. It seems the Cheetah's past has been manipulated by outside forces, and Minerva might just have been the trustworthy friend Diana believed her to be.

Highly educated and the recipient of two doctorates, Minerva had a passion for uncovering the mysterious lost history of the Amazons. She found work researching and archiving mystical artifacts at the Smithsonian and later for A.R.G.U.S., assessing her finds for possible military applications. However, when she encountered a powerful, godlike being called Urzkartaga, she was transformed into the superhuman Cheetah, a hybrid feline-human creature with a taste for human blood.

Just as Diana now embodies the ideals of physical battle, the Cheetah embodies those of the hunt, making her a formidable opponent. She is strong, fast, and catlike, with feral reflexes. When confronted, she is quite capable of using those attributes to harm innocent people.

Diana was eager to help with my research on the Cheetah, and it was through our conversations about the nature of her own power that I came to a better understanding of both women as metahumans.

The Cheetah appears to be a unique hybrid of human and feline, borrowing traits from both—but not fully embracing either.



What about the bones—delicate and lithe, like a cat's or more human?

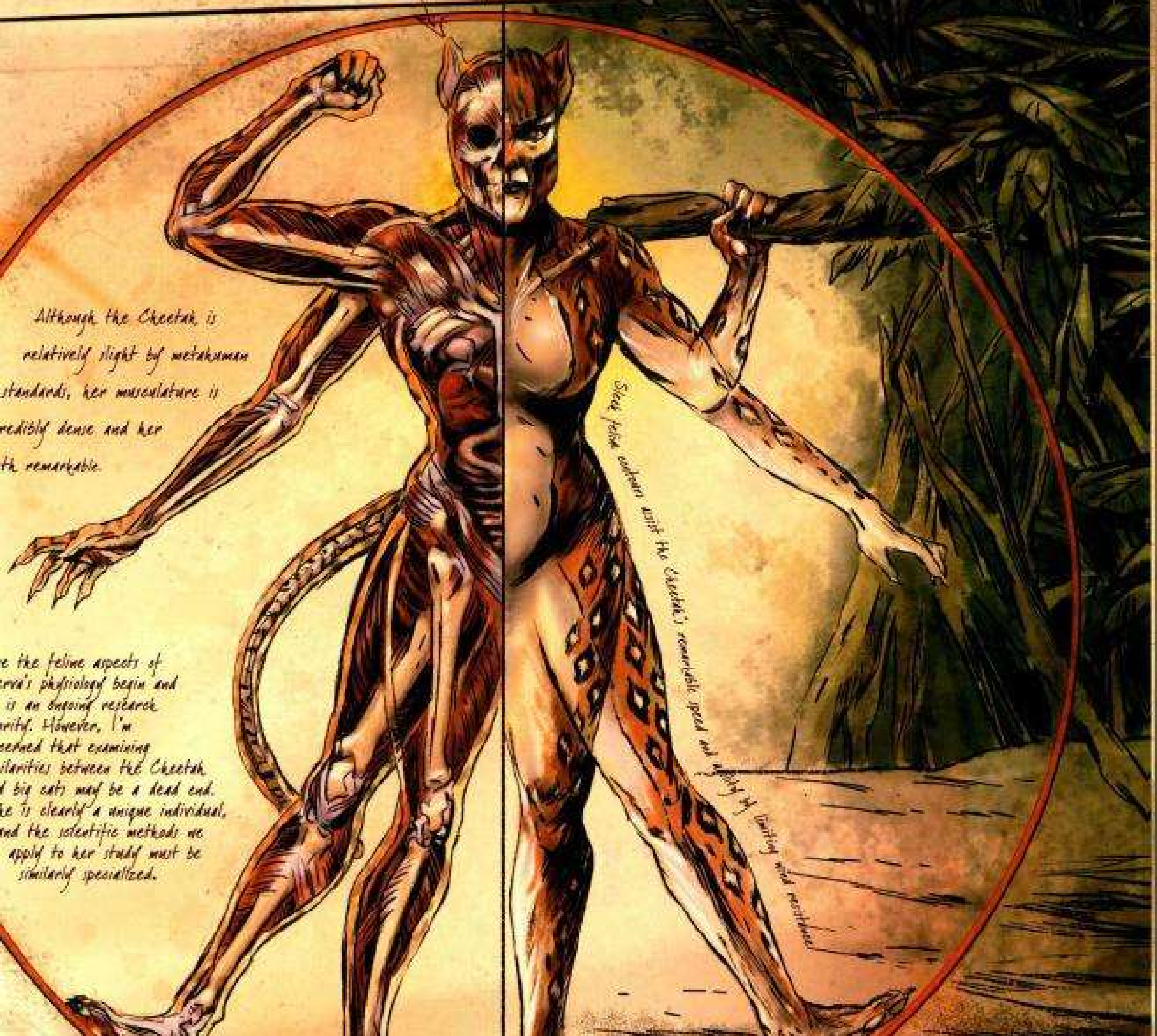
Her leaping and running abilities are feline, suggesting the muscular apportionment of a cat, but her form is primarily humanoid.

Do the joints straighten fully like a human's, or are they bent to allow for a feline's tighter tendons?

NOTE: The Cheetah's claws are so sharp that they can pierce my standard Batsuit. If possible, heavy armor should be worn when confronting her.

Her features, while catlike, don't appear to directly mirror a cat's morphology. For example, the orientation of her ears, the shortened nasal passages and lack of a frenulum, the grinding teeth—a cat's are jagged.

Diana is an excellent source of knowledge regarding the Cheetah's abilities. My main takeaway is that Minerva should not be trusted or underestimated.

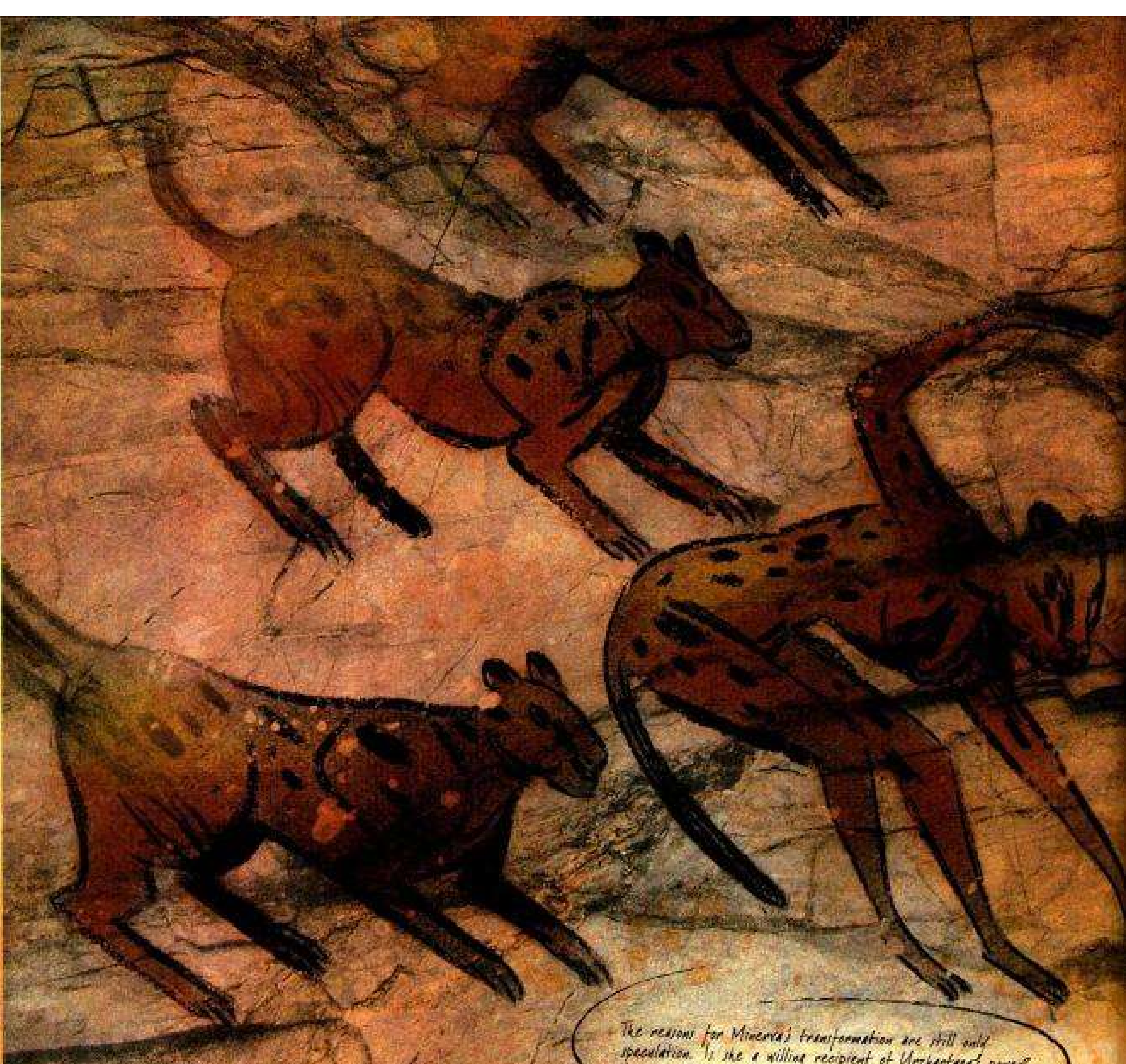


Although the Cheetah is relatively slight by metahuman standards, her musculature is redibly dense and her th remarkable.

Sleek feline contours assist the Cheetah's remarkable speed and agility by limiting wind resistance.

e the feline aspects of erva's physiology begin and is an ongoing research rity. However, I'm cerned that examining ilarities between the Cheetah d big cats may be a dead end. he is clearly a unique individual, nd the scientific methods we apply to her study must be similarly specialized.

According to Diana, the Cheetah's claws extend and retract like a cat's. I can't account for this ability as she clearly has hands rather than paws—the fingers are narrow and lack the pads that would support a full extension.



The reasons for Minerva's transformation are still only speculation. Is she a willing recipient of Urzkartaga's power? Or has she been cursed with the Cheetah's bloodlust?

Origin

Although Barbara Ann Minerva is now the Cheetah, this entity existed long before she inherited her powers. Prior to becoming an infamous super-villain, Minerva was a driven young woman from a wealthy family in Nottinghamshire, England. Despite her father's insistence that she stop wasting her time on Greek myths that detailed the adventures of the Amazons, Barbara Ann made studying the ancient tribe of legendary warrior women her life's focus. She studied archaeology, anthropology, and language, brilliantly investigating the Amazons' past and the location of their civilization. It was on one of her investigative trips that she was corrupted by the curse of the Cheetah when she came across Urzkartaga.

This ancient, primal entity had surrounded himself with women who served as his worshippers. The one chosen to be his bride would be imbued with the powers of the Cheetah, the protector of the group, and would be granted long life and power. Dr. Minerva was selected for this dubious honor, but when she displeased the corrupt Urzhartaga, he cursed her.

Regardless of whether I understand the science behind this so-called god-power, it clearly exists. Cheetah has specific traits that bear further study, including the hybrid body of a humanoid cat and claws that can damage even metahuman skin.

A.R.G.U.S. Metahuman Power Level Annual Assessment Form ASC-8
Name: Steve Trevor
Rank: Director of A.R.G.U.S.
Subject: Barbara Ann Minerva, aka the Cheetah
Threat Level: Upsilon

ADVANCED RESEARCH GROUP UNITING SUPERHUMANS

Throughout this report I have inserted a number of documents acquired during my intelligence gathering operations. While the sources are sometimes untrustworthy, the highly classified nature of much of this information and the clandestine methods used to collect it guarantee that it's worthy of further study.

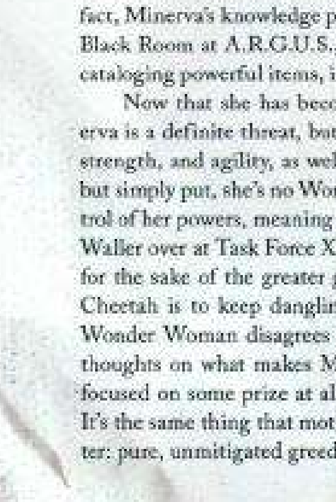
Assessment: I want to start out by saying that in no way, shape, or form am I a fan of magic. As the first recorded "outsider" to trespass on Themyscira, the uncharted island home of the Amazons, I've seen more than my share of gods and monsters, ancient mystical weapons, and actual honest-to-God witches. During the course of my relationship with Wonder Woman, I began to work with Dr. Barbara Ann Minerva, an employee of the Smithsonian. And for the first time, I thought I had an ally when it came to the world of magic. Unfortunately, Minerva's life would take a dark turn.

However, when I first met her, Barbara Ann had a way of grounding the unbelievable. She could identify weapons only alluded to in mythical texts and give us a heads-up if one of Diana's enemies had a weakness buried in the fine print of some ancient book no one had ever heard of. In fact, Minerva's knowledge proved invaluable, so I hired her to oversee the Black Room at A.R.G.U.S., where she was tasked with maintaining and cataloging powerful items, in both the literal and historical sense.

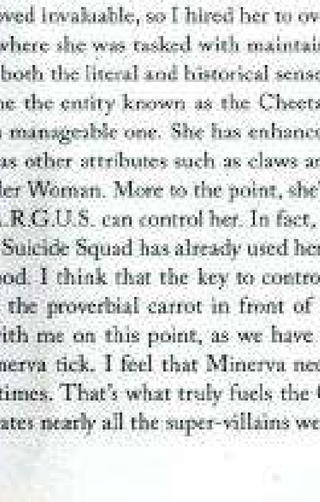
Now that she has become the entity known as the Cheetah, Minerva is a definite threat, but a manageable one. She has enhanced speed, strength, and agility, as well as other attributes such as claws and fangs, but simply put, she's no Wonder Woman. More to the point, she's in control of her powers, meaning A.R.G.U.S. can control her. In fact, Amanda Waller over at Task Force X's Suicide Squad has already used her abilities for the sake of the greater good. I think that the key to controlling the Cheetah is to keep dangling the proverbial carrot in front of her face. Wonder Woman disagrees with me on this point, as we have different thoughts on what makes Minerva tick. I feel that Minerva needs to be focused on some prize at all times. That's what truly fuels the Cheetah. It's the same thing that motivates nearly all the super-villains we encounter: pure, unmitigated greed.

ANALYSIS:
Trevor's assessment of the Cheetah's abilities has some merits, but his conclusions regarding her motivations may be overly reductive. We need to take a more holistic approach to understanding what motivates her so that we can plan for all eventualities and predict her behavior across a number of scenarios.

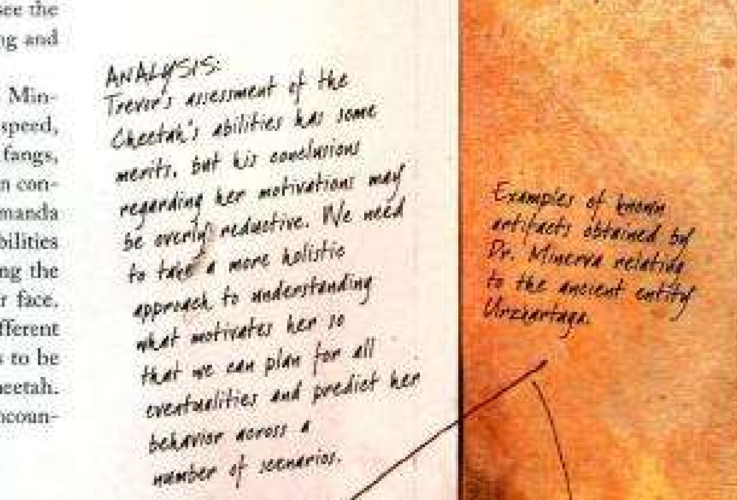
Examples of known artifacts obtained by Dr. Minerva relating to the ancient entity Urzkartaga.



A clay vase used in ritual ceremonies



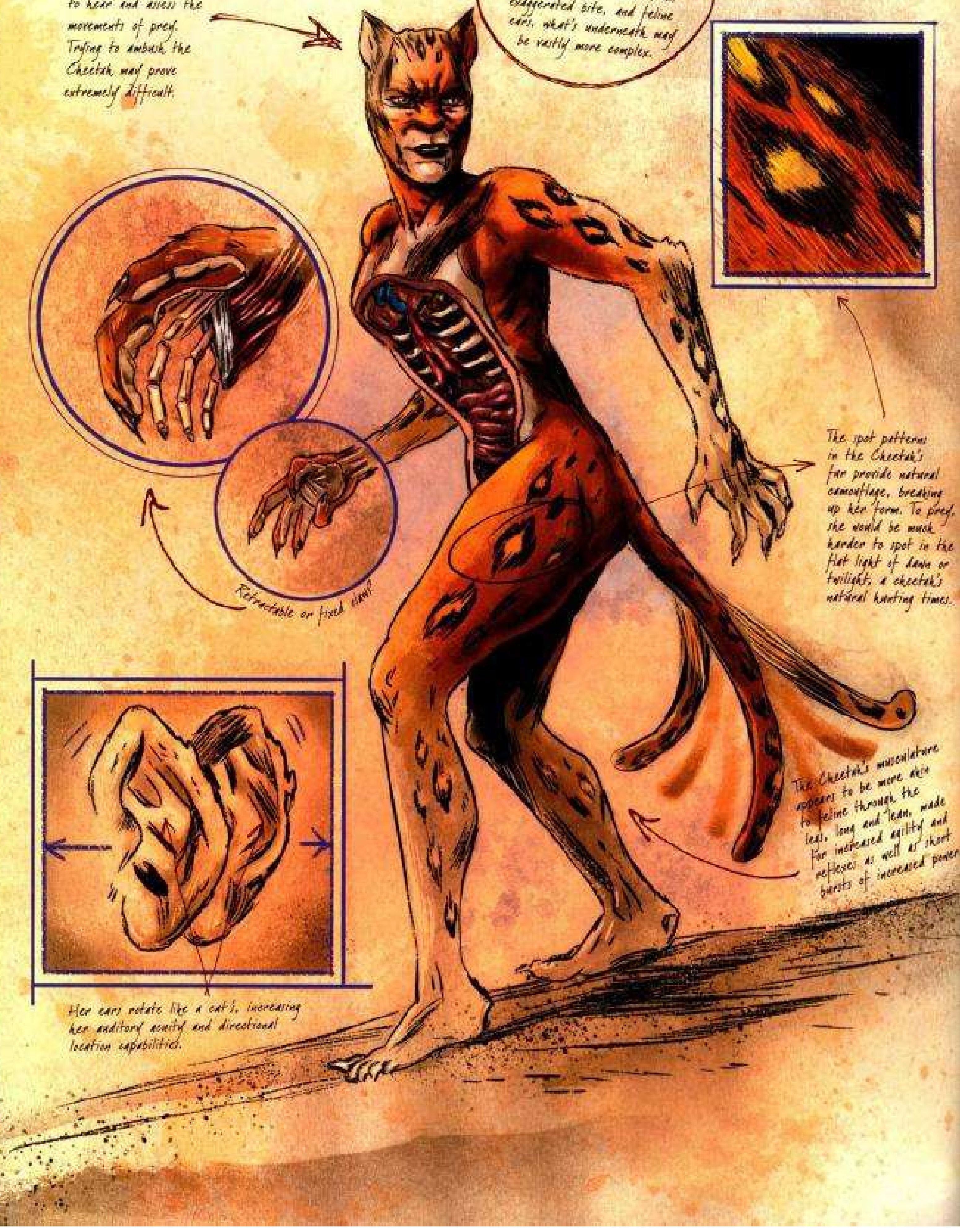
The primitive knife associated with the curse of the Cheetah



A chieftain's charm worn to honor the Huntress

A cat can discern tiny variations in sound, one-tenth of a tone apart, to hear and assess the movements of prey. Trying to ambush the Cheetah may prove extremely difficult.

Though it's tempting to visualize the Cheetah's skeletomuscular system as that of a human with a tail, an exaggerated bite, and feline ears, what's underneath may be vastly more complex.

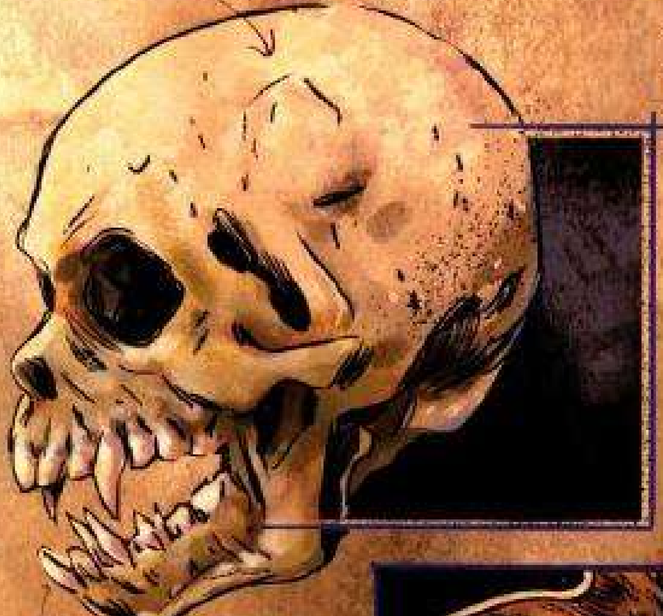

Retractable or fixed claw?

The spot patterns in the Cheetah's fur provide natural camouflage, breaking up her form. To prey, she would be much harder to spot in the flat light of dawn or twilight, a cheetah's natural hunting times.

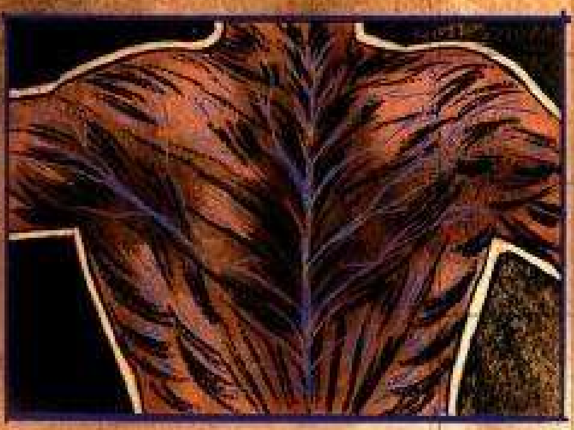
The Cheetah's musculature appears to be more akin to feline through the legs, long and lean, made for increased agility and reflexes as well as short bursts of increased power.

Her ears rotate like a cat's, increasing her auditory acuity and directional location capabilities.

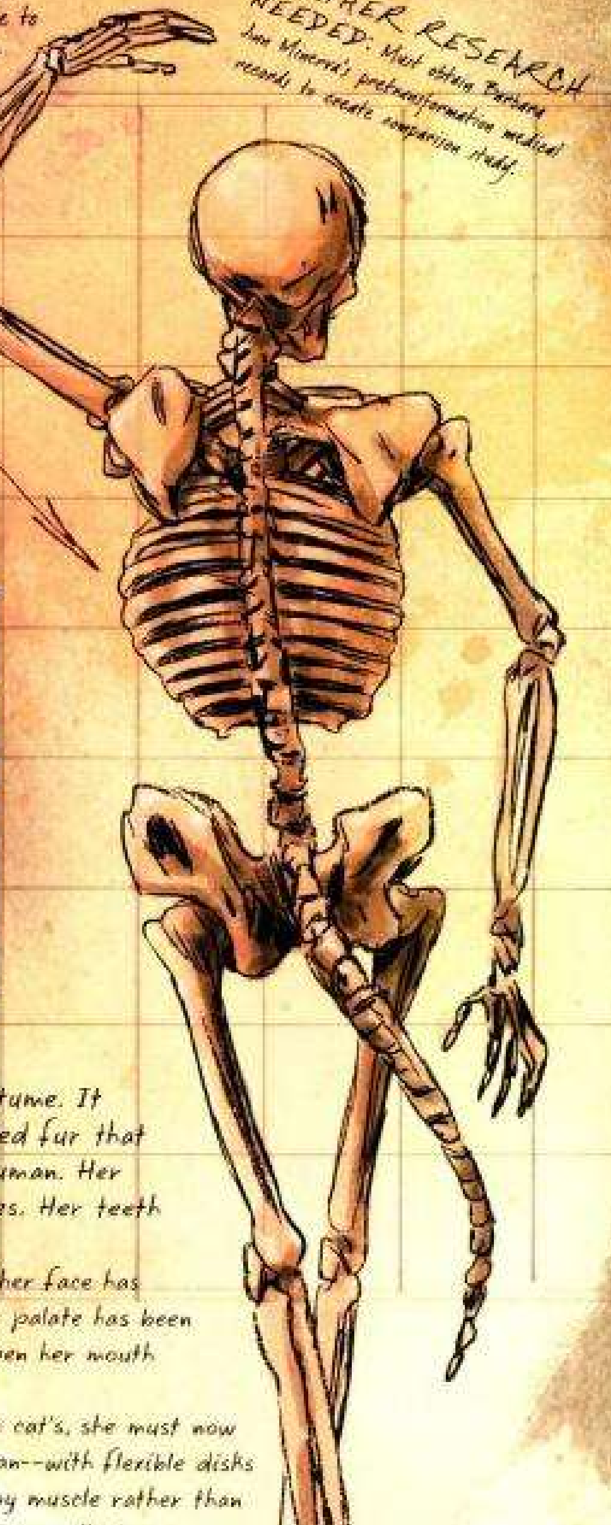
I can only assume that the Cheetah's skull is comparatively human in its composition, and only the mandible and maxilla (upper jawbone) are noticeably feline. Incisors and canines are prominent and used as a primary method of attack.



If the Cheetah's bite and ears are feline but her cranium is human, how is she able to accommodate and coordinate what should be exclusive muscle groups?



If her internal makeup is more feline than human—particularly her bones and surrounding musculature, claviculae, pelvis, scapulae, and vertebrae—she is likely able to easily squeeze through tight spaces, escape restraints, and hide in the smallest of enclosures.



FURTHER RESEARCH NEEDED: Must obtain Barbara Ann Minerva's pretransformation medical records to create companion study.

Physiology

At first sight, Barbara Ann looks like a woman in an elaborate cat costume. It is only as you get closer that you realize her "costume" is fine, spotted fur that covers every part of her and that her face and form aren't quite human. Her catlike ears twitch at distant sounds. Her long tail curls and switches. Her teeth are sharp, designed to rip and tear.

Her skull has remained large enough to accommodate a human brain, but her face has been subtly restructured by her transformation. The premaxilla of her upper palate has been extended as a separate bone for greater bite power; it also allows her to open her mouth considerably wider than before.

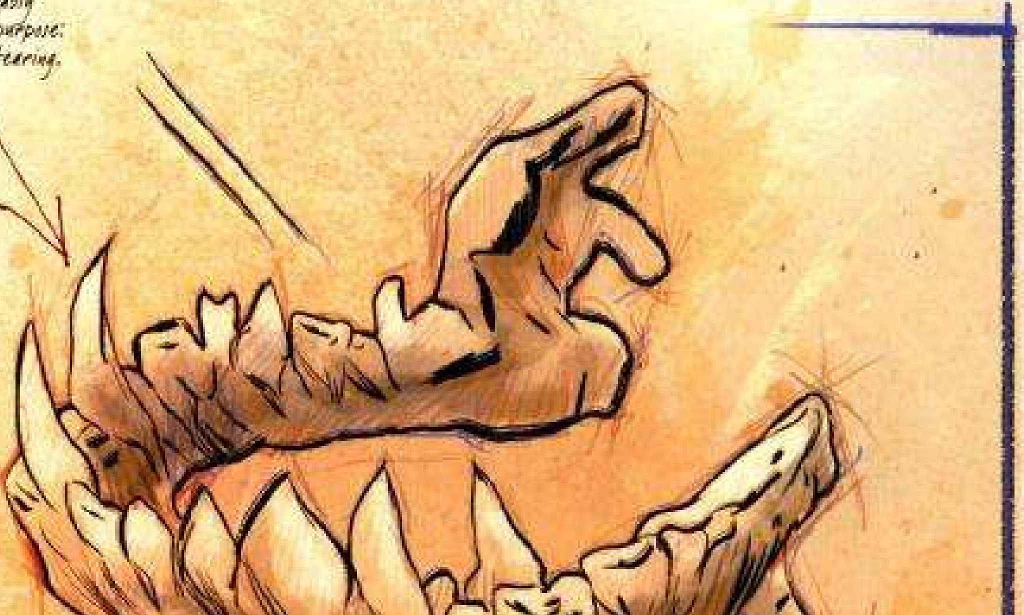
If the Cheetah's skeletomuscular system has been altered to be more like a cat's, she must now have more vertebrae--cats have fifty-three vertebrae, twenty more than a human--with flexible disks of elastic tissue connecting them. A cat's shoulders are attached to its frame by muscle rather than bone, allowing a cat to lengthen its stride--in order to run faster--and its narrow collarbone lets it twist and rotate to fit through tight spaces. Unlike a cat, the Cheetah has shoulder blades and a humanoid collarbone, but she exhibits quite nearly the same flexibility as a feline.

The Cheetah is as fast as a real cheetah when on all fours, running at up to seventy-five miles an hour in short bursts. As with her namesake, the Cheetah's tail acts as a rudder and as a counterbalance to her body weight, allowing her to quickly change direction while chasing prey.

It's possible that the Cheetah's musculature is enhanced by muscles that humans don't have: muscles that can be found in feline physiology. For example, if her thigh incorporates a variation of the cat's caudofemoralis muscle, this would greatly increase her running and leaping abilities. Cats also have specialized chest muscles to increase the abduction (extension) strength of their limbs so that they can run faster. She has obviously undergone a physical transformation, but how deep it goes isn't clear.

A feline's mouth has fewer teeth than a human's, but those teeth are remarkably well adapted to their purpose: piercing, holding, and tearing.

NOTE: Must obtain dental impression from the Cheetah to create cast for study. Use sodium alginate or silicone!



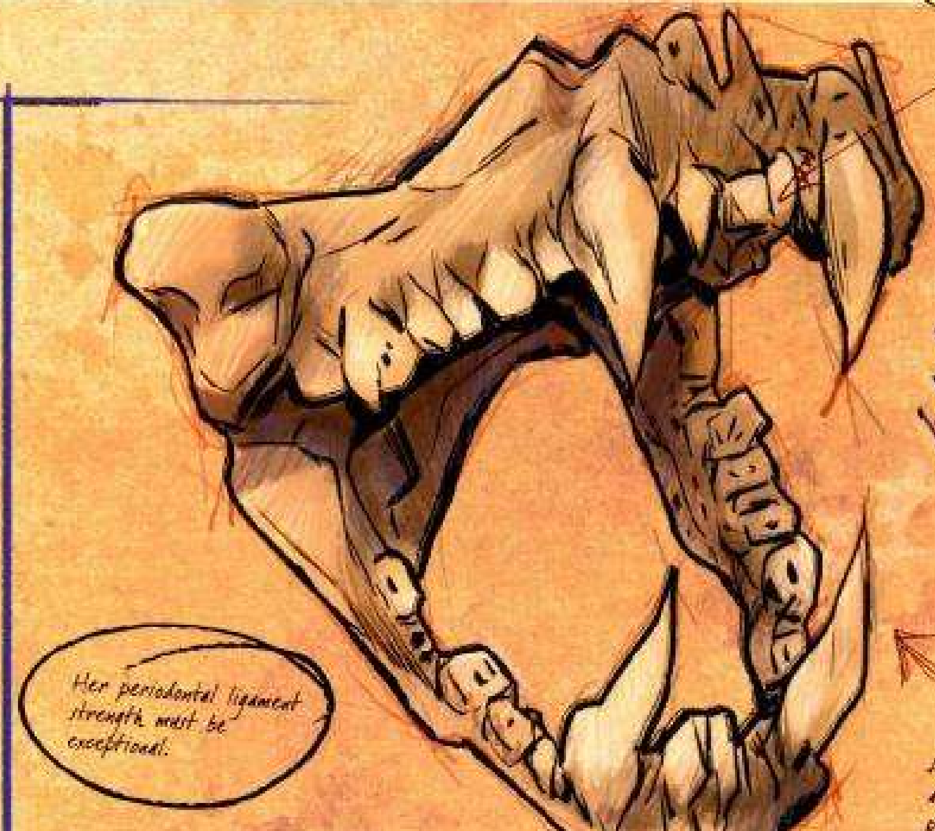
Cats are unable to regrow teeth they lose to decay or injury, much like humans. Assuming this is true of the Cheetah, any teeth she loses in combat would diminish her offensive capabilities considerably.

Interior and posterior incisors!

Temporomandibular joint structure

PRIORITY FOLLOW-UP RESEARCH:

Obtain police reports and medical information relating to the Cheetah's victims. Create a comparitive study of bite wounds, including data on depth of incision, resulting avulsions and contusions, and evidence of subsequent infection. Also chart orientation and breadth/width of bites. I believe broadening base of knowledge on this particular area will lead to important breakthroughs regarding the Cheetah's physiology as a whole.

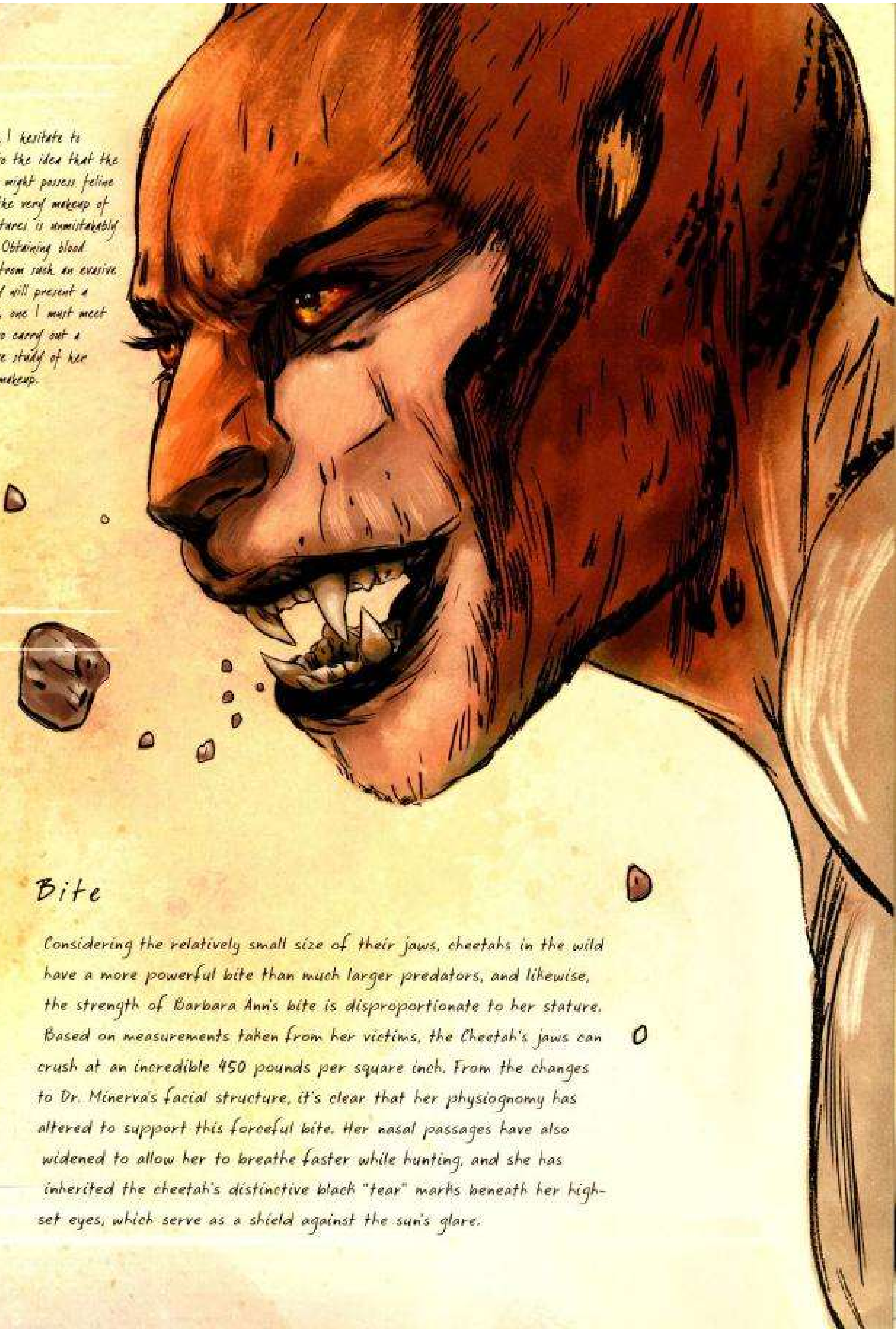


NOTE: Need to optimize armor to withstand 450 pounds of pressure, which I estimate the Cheetah can exert with her jaw.

Her periodontal ligament strength must be exceptional.

Are her teeth reinforced to accommodate the increased pressure of her bite?

Although I hesitate to commit to the idea that the Cheetah might possess feline DNA, the very makeup of her features is unmistakably leonine. Obtaining blood samples from such an evasive adversary will present a challenge, one I must meet if I'm to carry out a definitive study of her genetic makeup.

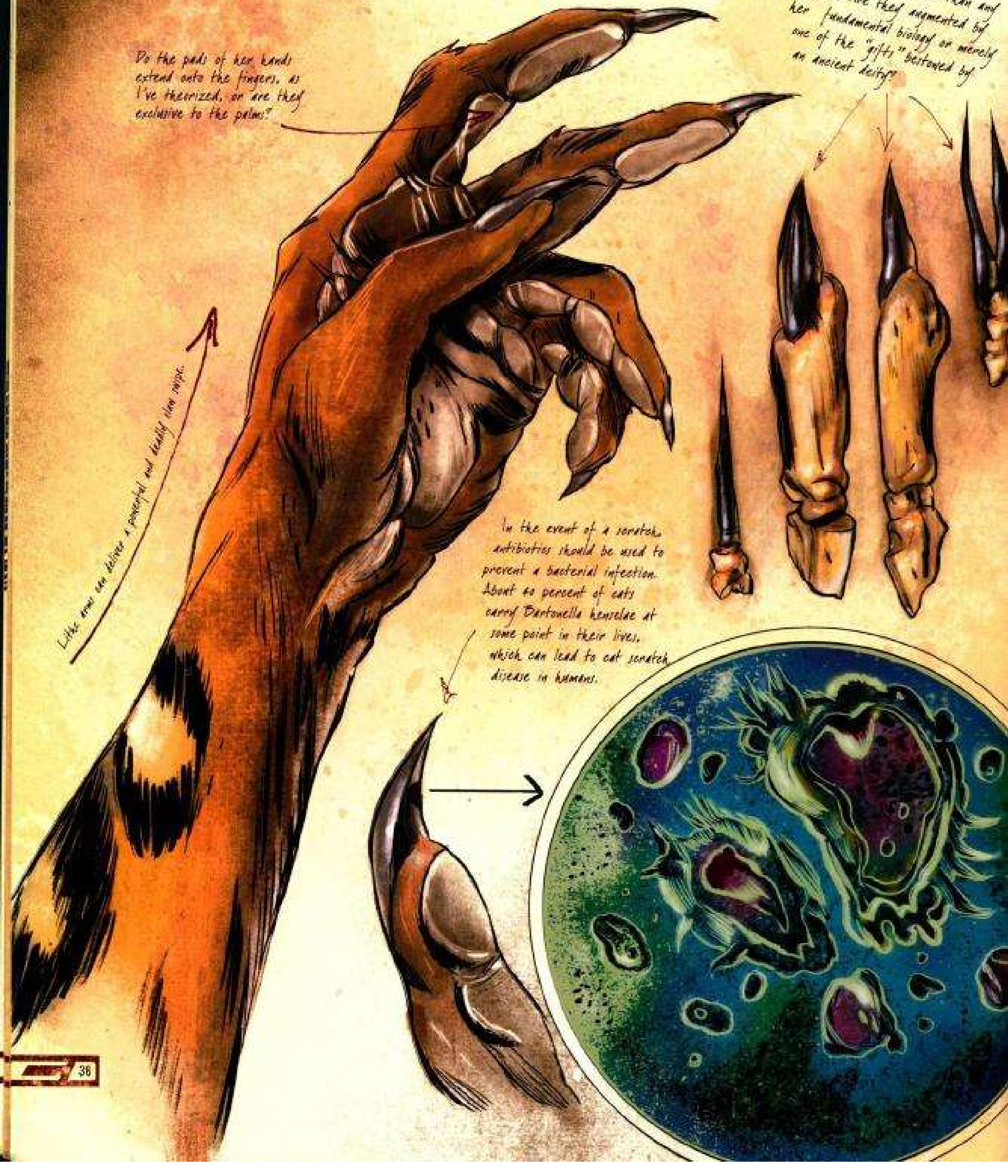


Bite

Considering the relatively small size of their jaws, cheetahs in the wild have a more powerful bite than much larger predators, and likewise, the strength of Barbara Ann's bite is disproportionate to her stature. Based on measurements taken from her victims, the Cheetah's jaws can crush at an incredible 450 pounds per square inch. From the changes to Dr. Minerva's facial structure, it's clear that her physiognomy has altered to support this forceful bite. Her nasal passages have also widened to allow her to breathe faster while hunting, and she has inherited the cheetah's distinctive black "tear" marks beneath her high-set eyes, which serve as a shield against the sun's glare.

Claws

Like her bite, the Cheetah's razor-sharp claws have a toxic effect; they not only slice flesh and tissue but also violently disrupt it. Wounds caused by her claws heal slower and scar more heavily than wounds caused by a standard cut. Presumably her claws are bacteria-ridden and highly toxic.



The Cheetah's claws appear to be stronger and more durable than any big cat's. Are they augmented by her fundamental biology or merely one of the "gifts" bestowed by an ancient deity?

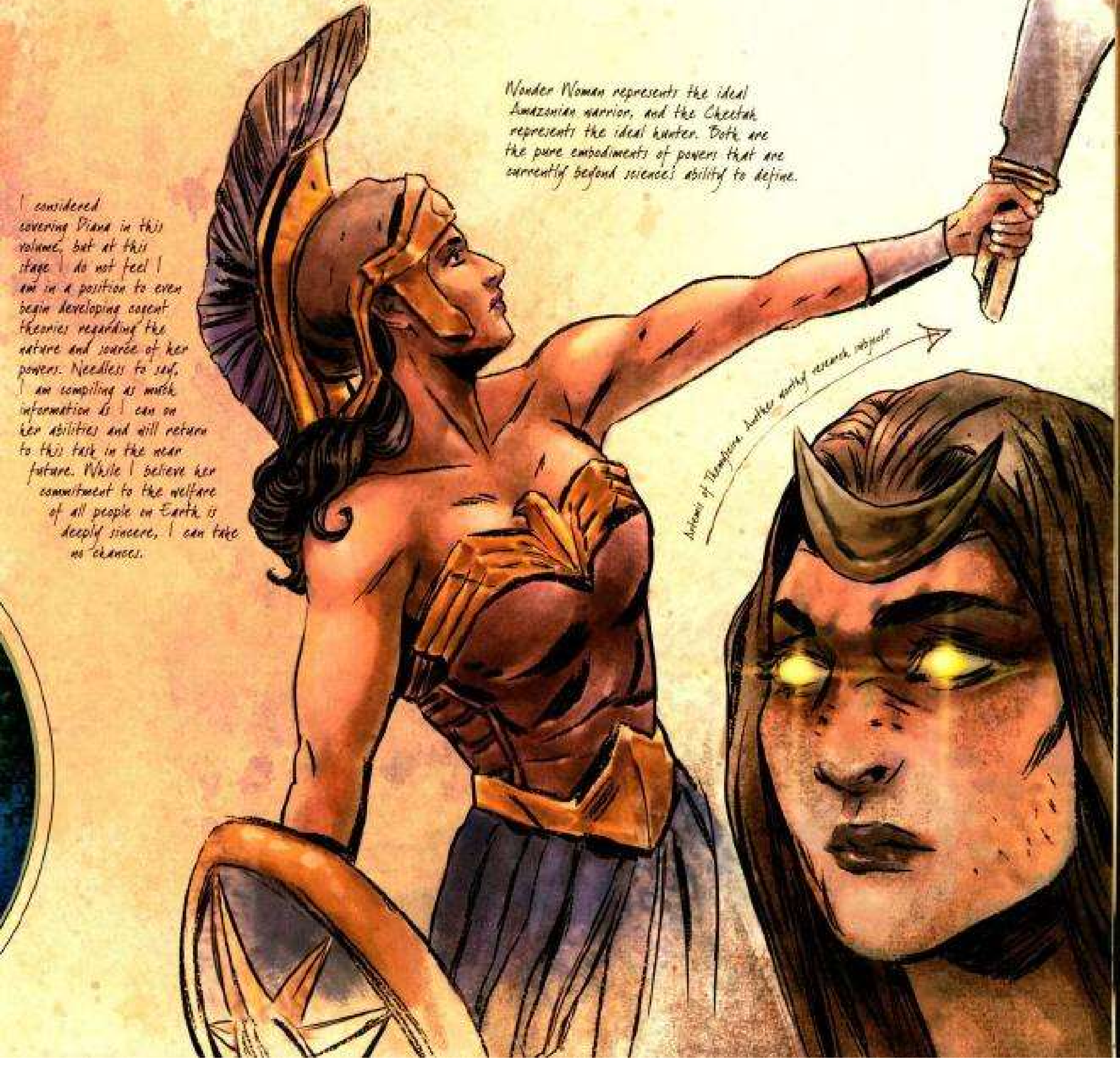
Do the pads of her hands extend onto the fingers, as I've theorized, or are they exclusive to the palms?

Lithe arms can deliver a powerful and deadly claw swipe.

In the event of a scratch, antibiotics should be used to prevent a bacterial infection. About 40 percent of cats carry Bartonella henselae at some point in their lives, which can lead to cat scratch disease in humans.

God-Power

As with many inexplicable forces in this report, science has not offered a clear explanation for how the Cheetah was able to transform Dr. Minerva, or how Minerva is able to manifest these godlike powers. An expert in this arena, Diana offered me some insight into the metahumans that came to be known as the Greek gods. Each "god" represented a human ideal, the perfect embodiment of all that was connected to that ideal. Obviously, there's not going to be a lot of empirical evidence when it comes to talking about these "embodiments." There are those who believe that gods gain power from being worshipped, but I'm not prepared to make that leap. Godlike beings exist, but whether they're spiritual manifestations, creatures with better technology than ours, or simply powerful metahumans remains to be seen.

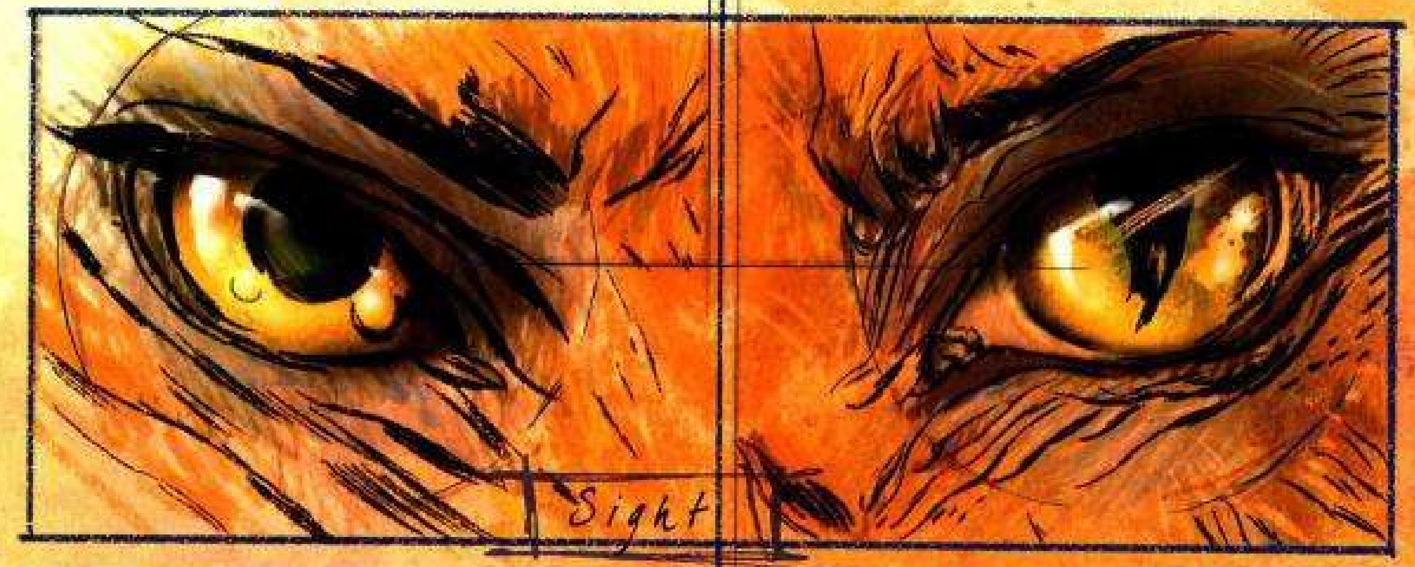


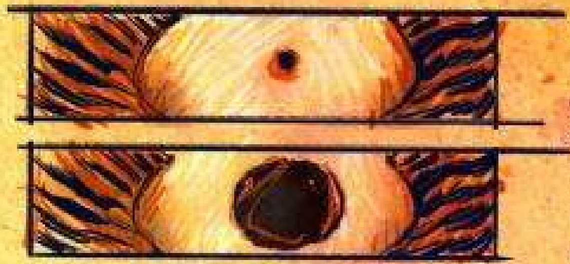
Wonder Woman represents the ideal Amazonian warrior, and the Cheetah represents the ideal hunter. Both are the pure embodiments of powers that are currently beyond science's ability to define.

I considered covering Diana in this volume, but at this stage I do not feel I am in a position to even begin developing cogent theories regarding the nature and source of her powers. Needless to say, I am compiling as much information as I can on her abilities and will return to this task in the near future. While I believe her commitment to the welfare of all people on Earth is deeply sincere, I can take no chances.

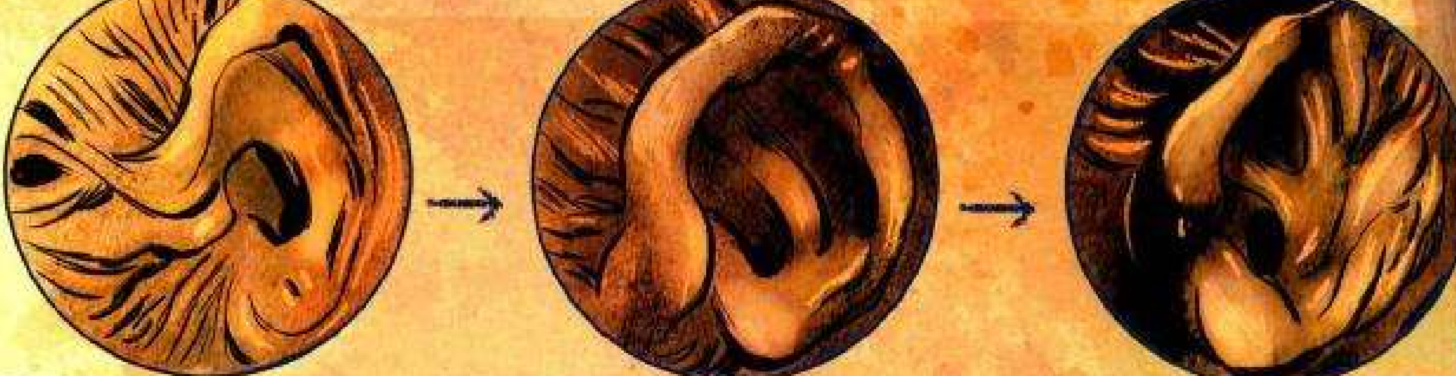
Artemis of Themyscira. Another worthy research subject.

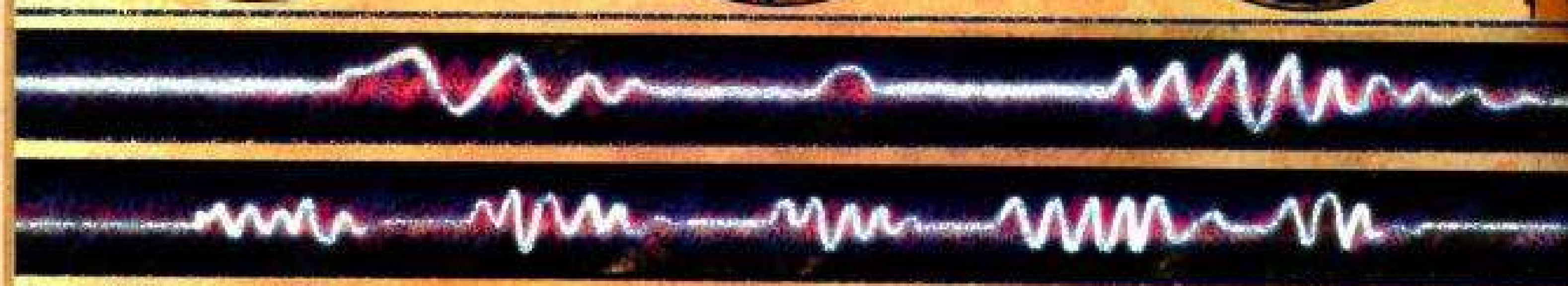
SENSES





Having seen the Cheetah up close, I can attest that her eyes are more catlike than human, the pupils dilating to slits under bright light, a nictitating membrane just visible when she blinks slowly. Like most animals with retroreflectors, her night vision is far better than a human's. In daylight, her visual acuity surpasses a human's several times over. Additionally, her ability to dilate her eyes gives her a panoramic view of the world, with wider peripheral vision.





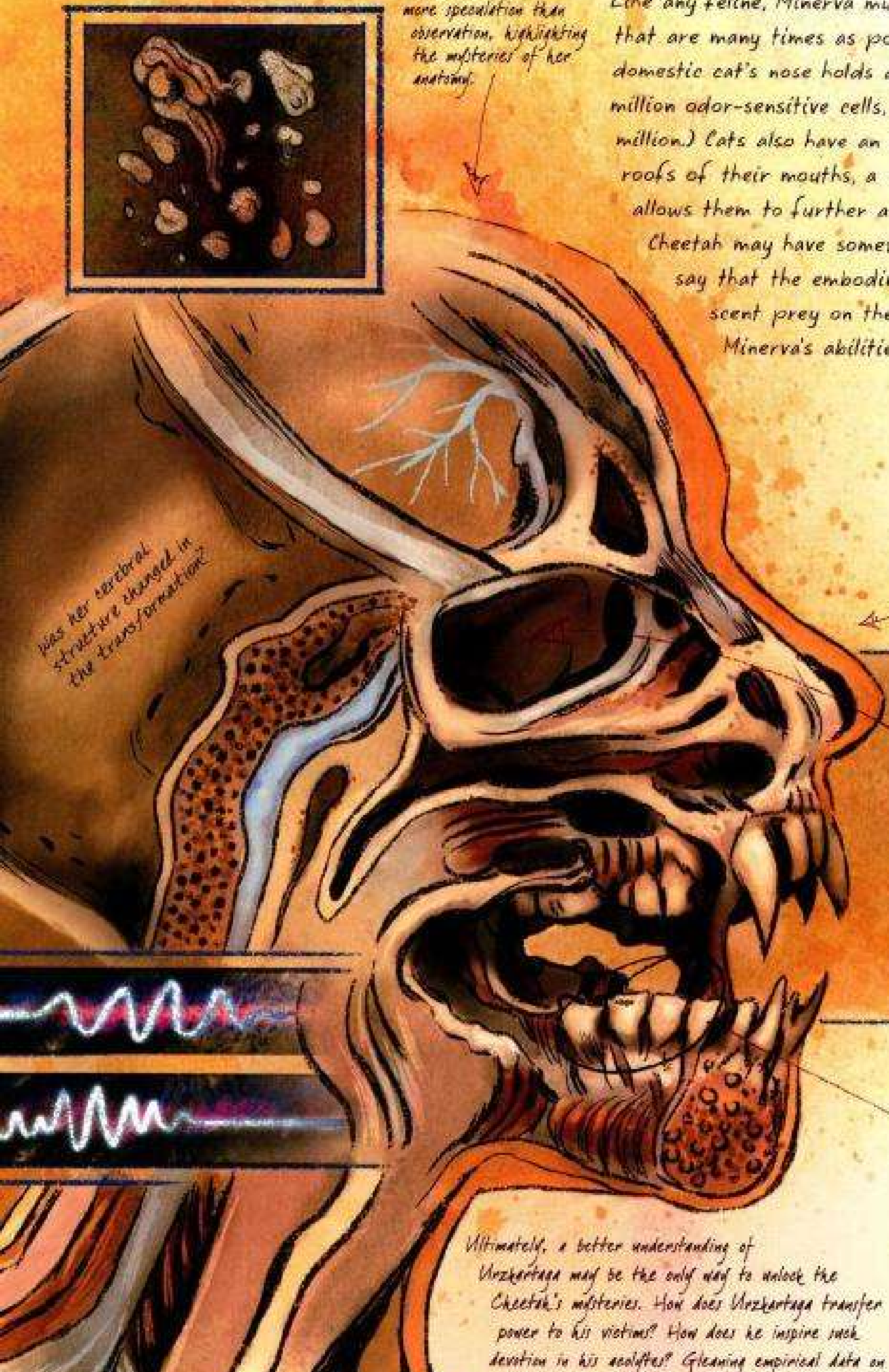
Hearing

Like any cat, the Cheetah can rotate her external ear to channel sound more effectively. Humans and cats have a similar hearing range for low tones, but cats can hear frequencies up to 100,000 hertz. The Cheetah has been observed to be particularly sensitive to high-pitch frequencies.

Cheetah's vocalizations are not strictly feline or entirely human. Is her vocal range enhanced like her hearing?

Smell

Like any feline, Minerva must have olfactory abilities that are many times as powerful as a human's. (A domestic cat's nose holds approximately two hundred million odor-sensitive cells, versus a human's five million.) Cats also have an extra scent organ in the roofs of their mouths, a vomeronasal organ that allows them to further analyze unusual smells. The Cheetah may have something equivalent. Legends say that the embodiment of Cheetah is able to scent prey on the wind from miles away, and Minerva's abilities seem to back this up.



This cutaway of the Cheetah's skull is more speculation than observation, highlighting the mysteries of her anatomy.

Does she utilize the vomeronasal organ typical of felines?

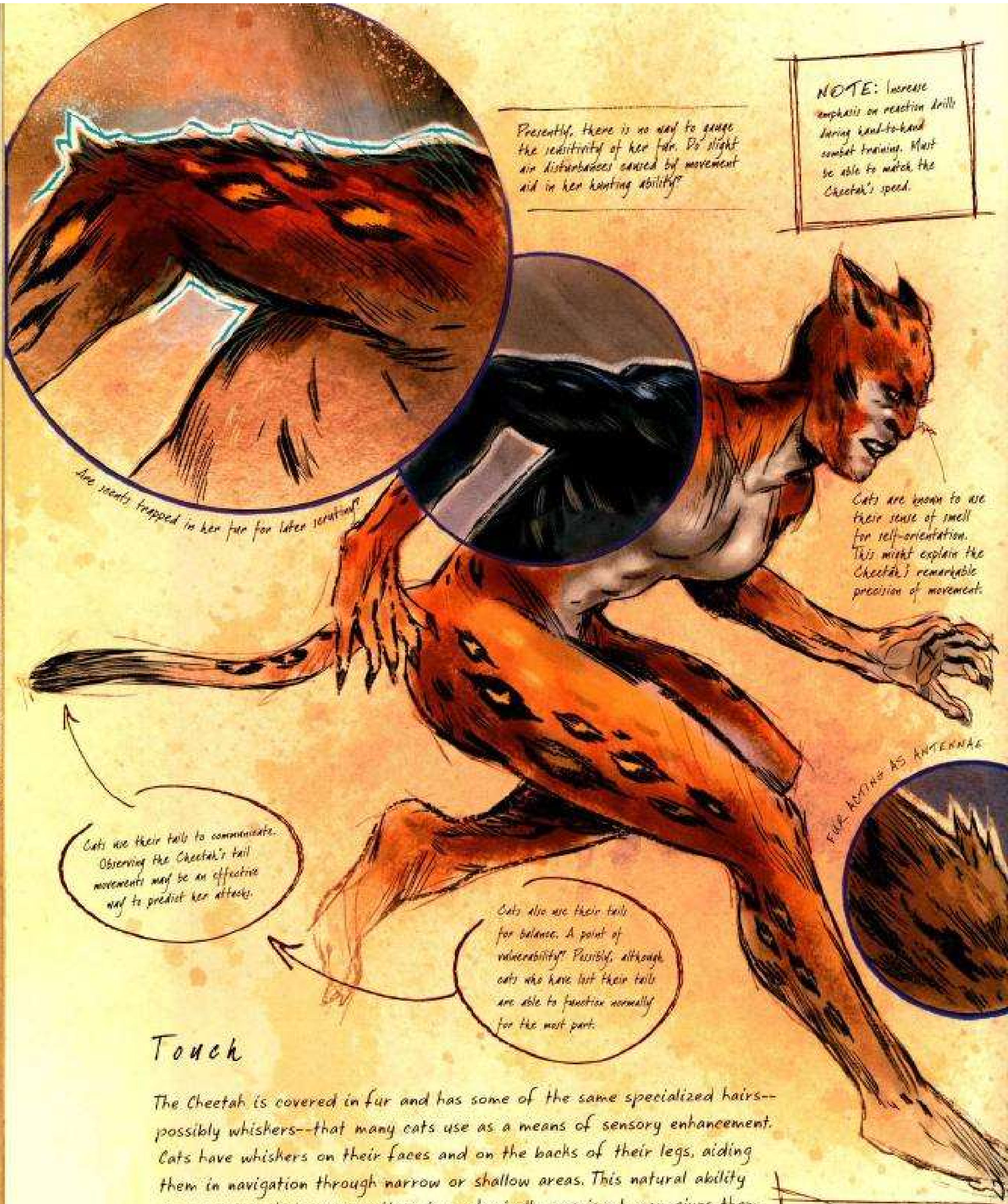
Was her cerebral structure changed in the transformation?

Cats are genetically farsighted and rely more on smell than sight at close range. Is the Cheetah able to self-adjust her optics for close observation, or does she also rely on scent?

Are her molars flattened like human teeth, or are they truly feline, suited to an exclusively carnivorous diet?

Ultimately, a better understanding of Urzkartaga may be the only way to unlock the Cheetah's mysteries. How does Urzkartaga transfer power to his victims? How does he inspire such devotion in his acolytes? Gleaning empirical data on beings that appear to be godlike is fraught with challenges, but as this study continues it will no doubt become a primary objective. Perhaps a deeper dive into the databases of A.R.G.U.S. is required?

NOTE: Have Alfred book a trip to the Bwunda, specifically the Okarango Region.



Presently, there is no way to gauge the sensitivity of her fur. Do slight air disturbances caused by movement aid in her hunting ability?

NOTE: Increase emphasis on reaction drills during hand-to-hand combat training. Must be able to match the Cheetah's speed.

Are scents trapped in her fur for later scrutiny?

Cats are known to use their sense of smell for self-orientation. This might explain the Cheetah's remarkable precision of movement.

Cats use their tails to communicate. Observing the Cheetah's tail movements may be an effective way to predict her attacks.

Cats also use their tails for balance. A point of vulnerability? Possibly, although cats who have lost their tails are able to function normally for the most part.

Touch

The Cheetah is covered in fur and has some of the same specialized hairs--possibly whiskers--that many cats use as a means of sensory enhancement. Cats have whiskers on their faces and on the backs of their legs, aiding them in navigation through narrow or shallow areas. This natural ability to recognize their surroundings in a physically cognizant way gives them a huge advantage in hunting, informing their bodies where they can and can't fit. Considering the ease with which the Cheetah nimbly navigates her environment, she may also use these specialized spatial antennae.

Does damage to the Cheetah's fur impair her spatial awareness? Could some form of aggressive epilation be an effective means of disorienting her in combat? More research needed.

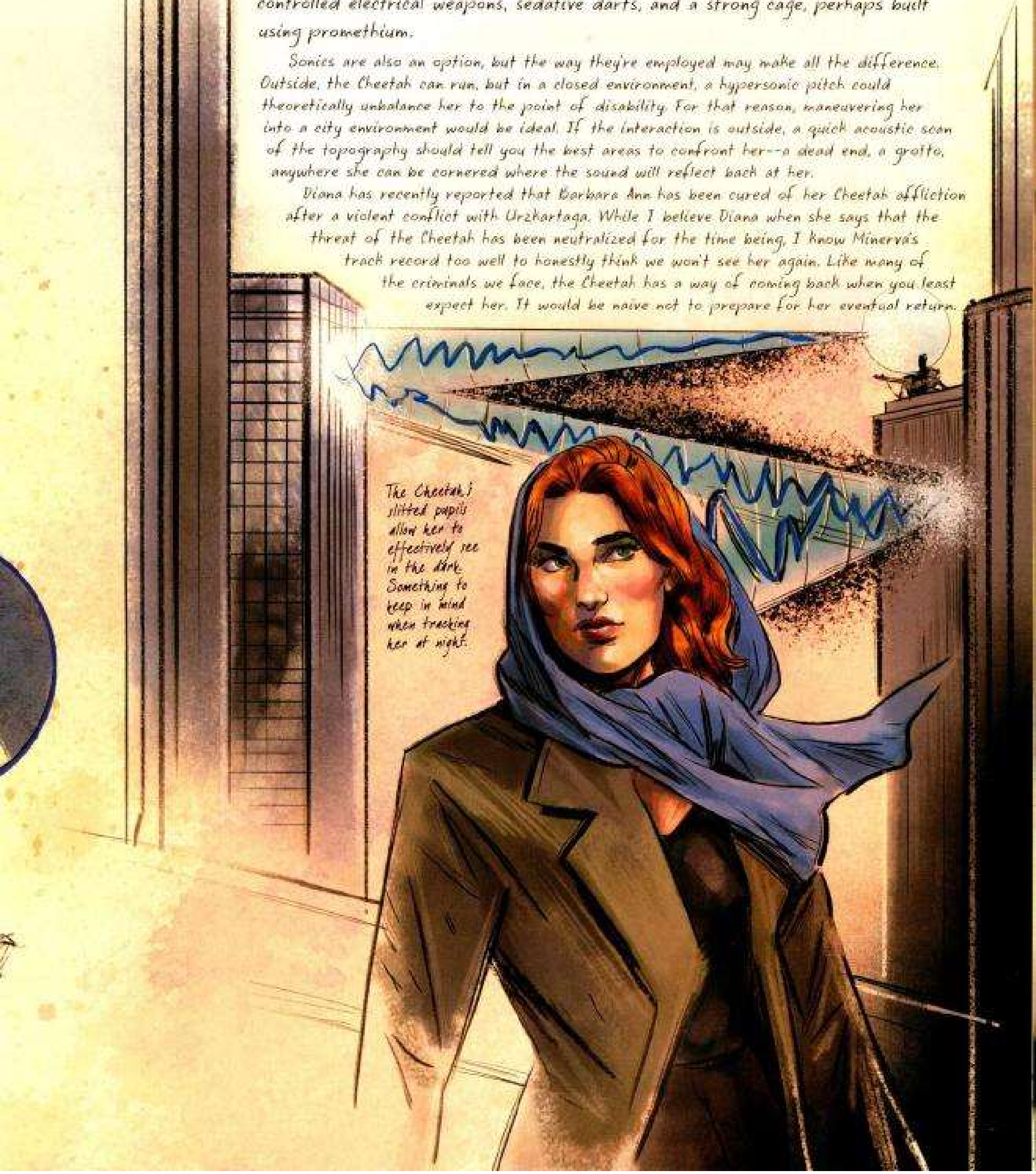
Weaknesses

Big cats generally hunt in the daytime but are also known to be crepuscular--more active at dawn and dusk. Many predators prefer low sensory input when hunting, allowing them greater focus on their prey. Attempting to apprehend the Cheetah in a noisy, bright, odorous environment might give us a slight advantage.

Considering her ferocity, keeping a distance would be a wise choice. We should look into the equipment used for trapping and transporting large animals--nets, controlled electrical weapons, sedative darts, and a strong cage, perhaps built using promethium.

Sonics are also an option, but the way they're employed may make all the difference. Outside, the Cheetah can run, but in a closed environment, a hypersonic pitch could theoretically unbalance her to the point of disability. For that reason, maneuvering her into a city environment would be ideal. If the interaction is outside, a quick acoustic scan of the topography should tell you the best areas to confront her--a dead end, a grotto, anywhere she can be cornered where the sound will reflect back at her.

Diana has recently reported that Barbara Ann has been cured of her Cheetah affliction after a violent conflict with Urzkartaga. While I believe Diana when she says that the threat of the Cheetah has been neutralized for the time being, I know Minerva's track record too well to honestly think we won't see her again. Like many of the criminals we face, the Cheetah has a way of coming back when you least expect her. It would be naive not to prepare for her eventual return.



The Cheetah's slitted pupils allow her to effectively see in the dark. Something to keep in mind when tracking her at night.

AQUAMAN

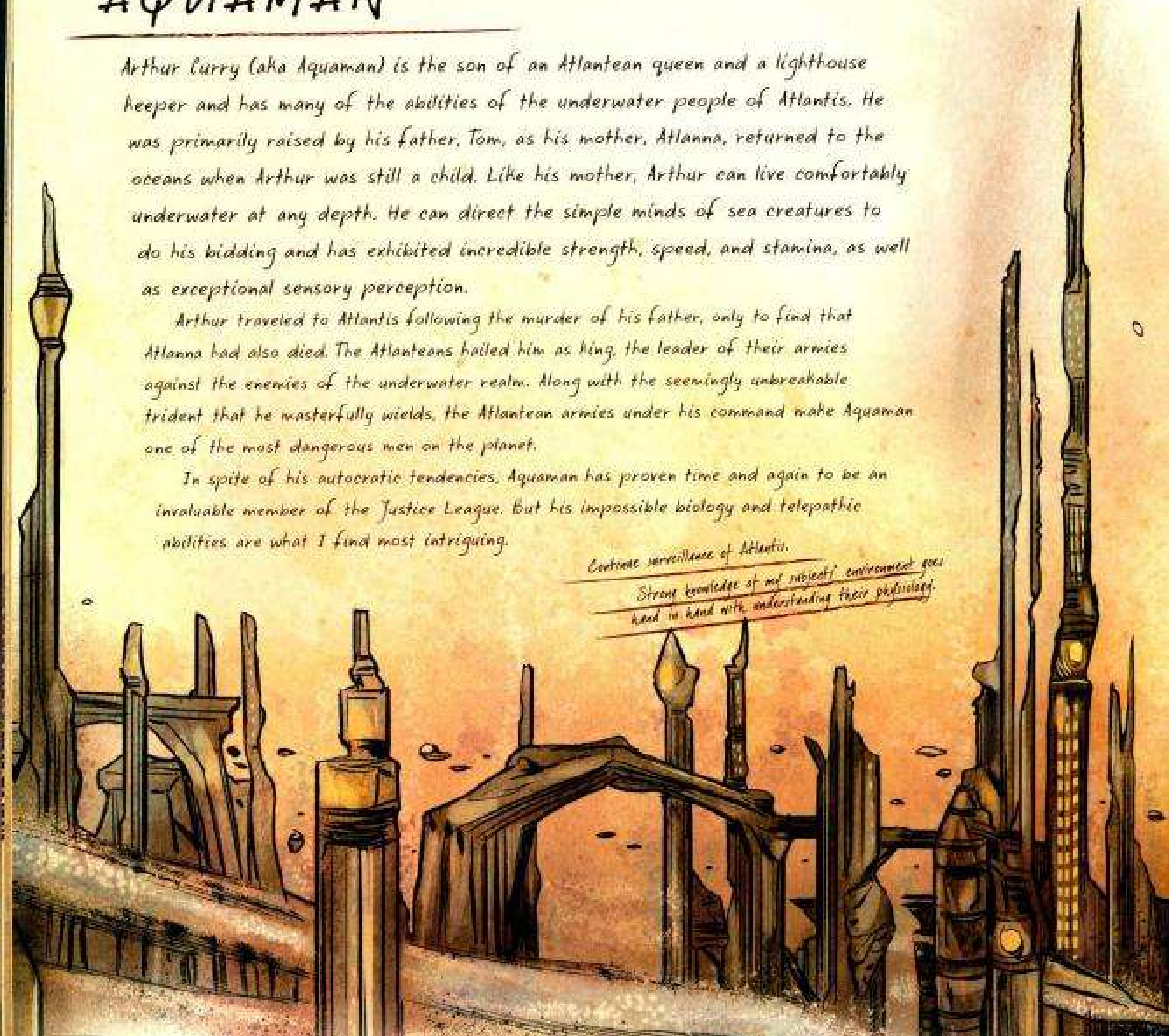
Arthur Curry (aka Aquaman) is the son of an Atlantean queen and a lighthouse keeper and has many of the abilities of the underwater people of Atlantis. He was primarily raised by his father, Tom, as his mother, Atlanna, returned to the oceans when Arthur was still a child. Like his mother, Arthur can live comfortably underwater at any depth. He can direct the simple minds of sea creatures to do his bidding and has exhibited incredible strength, speed, and stamina, as well as exceptional sensory perception.

Arthur traveled to Atlantis following the murder of his father, only to find that Atlanna had also died. The Atlanteans hailed him as king, the leader of their armies against the enemies of the underwater realm. Along with the seemingly unbreakable trident that he masterfully wields, the Atlantean armies under his command make Aquaman one of the most dangerous men on the planet.

In spite of his autocratic tendencies, Aquaman has proven time and again to be an invaluable member of the Justice League. But his impossible biology and telepathic abilities are what I find most intriguing.

Continue surveillance of Atlantis.

Strong knowledge of my subjects' environment goes hand in hand with understanding their physiology.

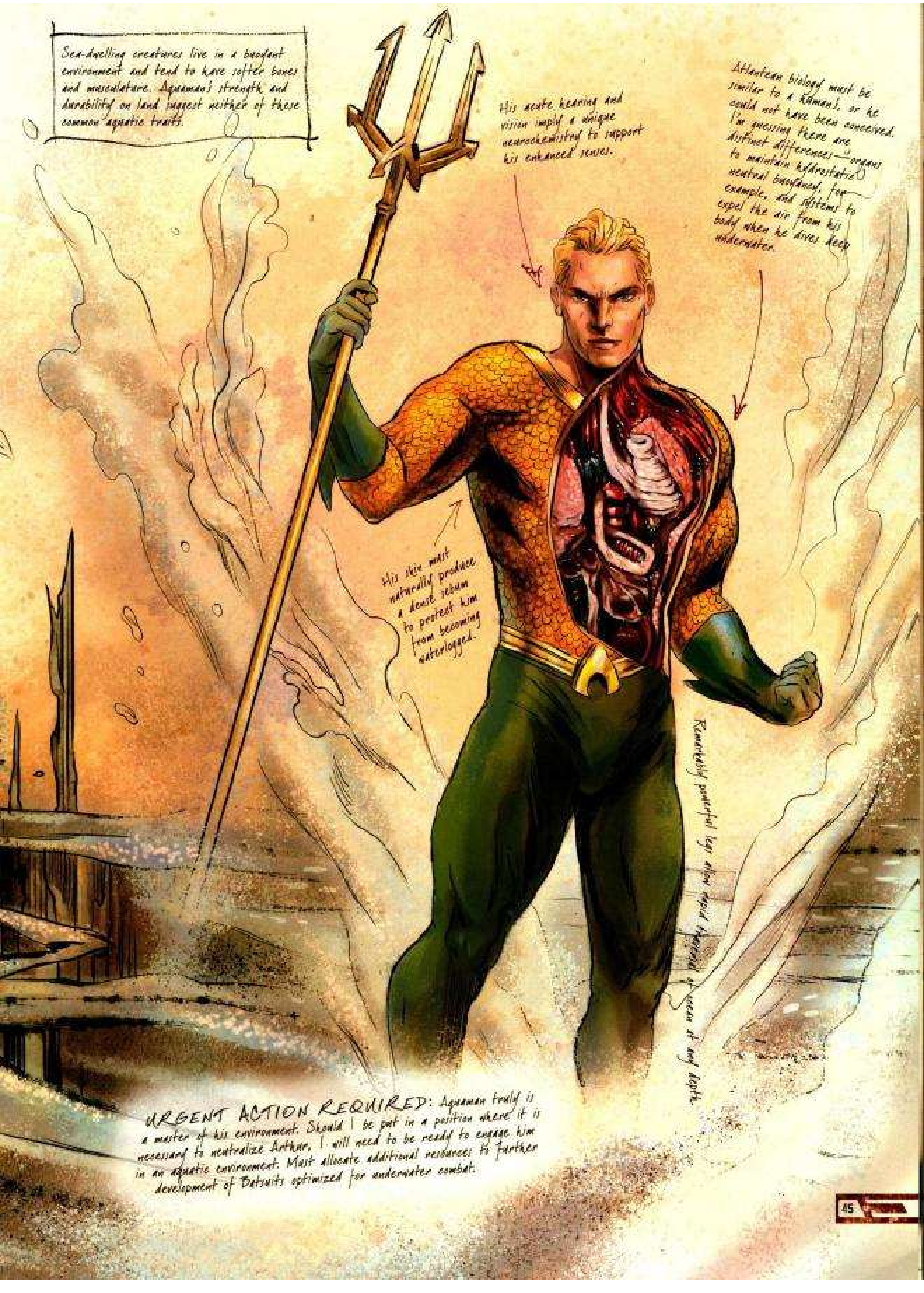


Atlantis

Considered a mythical city for much of human history, the existence of Atlantis was exposed a few years ago in a successful book by David Graves. However, it wasn't until Aquaman's public debut that people began to take the legends of this mysterious underwater continent seriously.

Atlantis was originally constructed on land by Atlan, its original king and architect. Atlan's throne was taken from him by his brother, Orin, leading Atlan to seek vengeance. He killed King Orin and sunk the nation, causing its seven kingdoms to be split. Only 10 percent of the population managed to adapt to life underwater and survive.

After an attack on Gotham City by Atlantean forces led by the super-villain Ocean Master--Aquaman's own half-brother, Orm Marius--the world has come to realize just how powerful this underwater civilization truly is. An entire sunken continent, armed with advanced technology and extremely durable soldiers, Atlantis has proven itself a true threat, one only kept in check by Aquaman himself, a descendant of their fabled King Orin.



Sea-dwelling creatures live in a buoyant environment and tend to have softer bones and musculature. Aquaman's strength and durability on land suggest neither of these common aquatic traits.

His acute hearing and vision imply a unique neurochemistry to support his enhanced senses.

Atlantean biology must be similar to a human's, or he could not have been conceived. I'm guessing there are distinct differences—organs to maintain hydrostatic neutral buoyancy, for example, and systems to expel the air from his body when he dives deep underwater.

His skin must naturally produce a dense sebum to protect him from becoming waterlogged.

Remarkably powerful legs allow rapid traversal of ocean at any depth.

URGENT ACTION REQUIRED: Aquaman truly is a master of his environment. Should I be put in a position where it is necessary to neutralize Arthur, I will need to be ready to engage him in an aquatic environment. Must allocate additional resources to further development of Batsuits optimized for underwater combat.

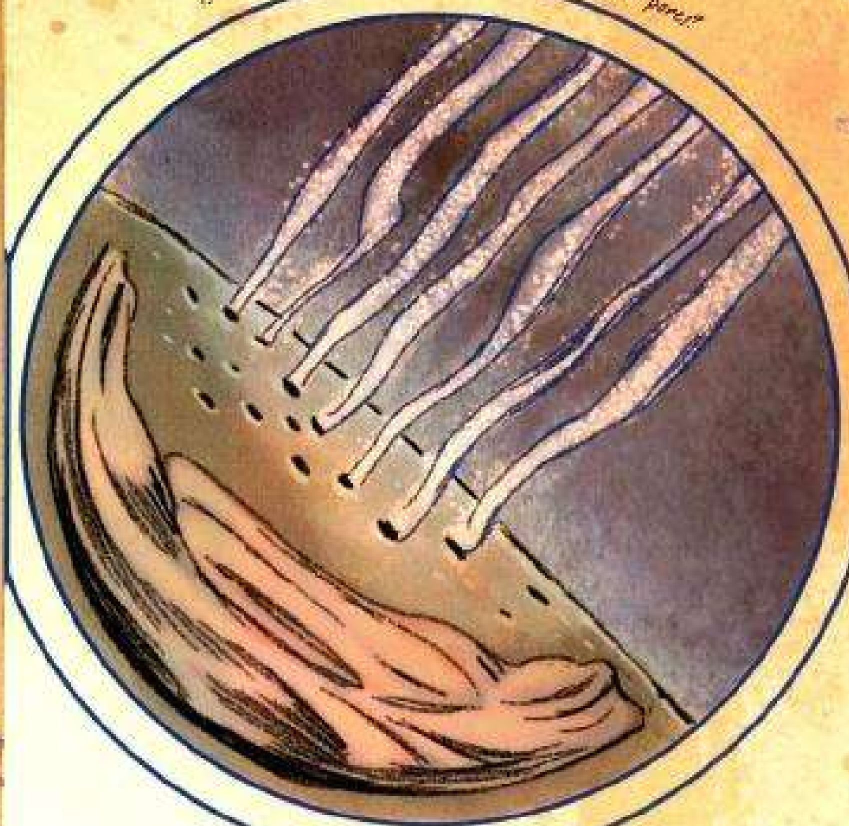
Breathing

Aquaman cannot be categorized as an amphibian or a fish, but his ability to survive and thrive both in and out of water means he's not entirely mammalian, either. In water, he doesn't seem to suffer any ill effect from osmotic pressure, the ocean's consistently cold temperatures, or decompression sickness, suggesting Aquaman has an extremely complicated biology that extends beyond the mere presence of gills. Unfortunately, I was unable to access Dr. Stephen Shin's private files, but I feel comfortable at least making a few educated guesses. (A marine biologist, Shin studied Arthur extensively as a child.)

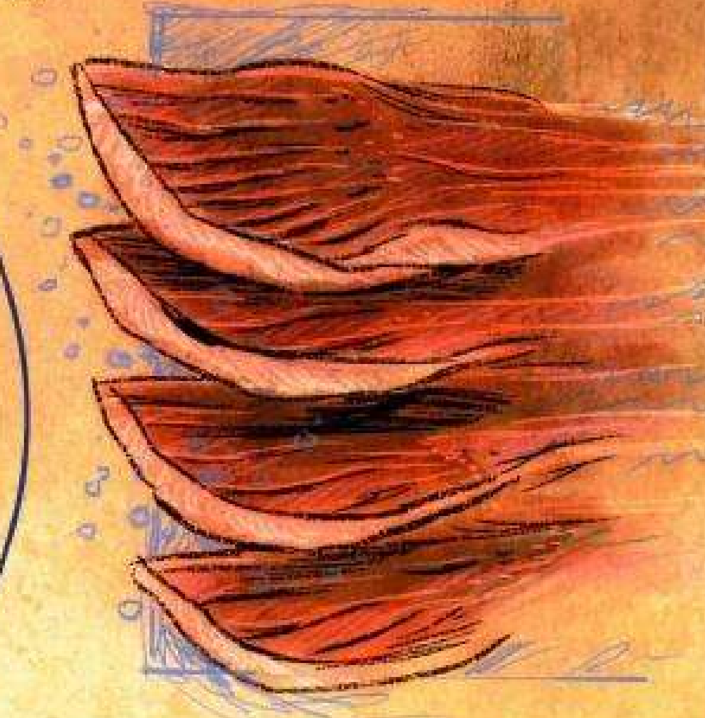
Mammalian lungs take in air and use the specialized cells alveoli to remove carbon dioxide, processing the molecules into a gas we exhale. Fish exchange gases by pulling water into their mouths and pumping it over their gills--thin, highly folded filaments of tissue where oxygen and carbon dioxide are exchanged. Afterward, the deoxygenated water is vented. Water density keeps the gills from collapsing, which is why a fish out of water doesn't last long.

My best guess is that Aquaman has functional humanoid lungs for use on land. He doesn't have traditional gills, so I propose a gill effect that takes over upon immersion in water, something I believe might be a cellular process. Fish have to gulp regularly to keep water moving over their gills, the same reason most sharks move constantly, even while sleeping. Aquaman can hold perfectly still underwater, without visibly processing the dissolved oxygen. To me, that suggests that he absorbs oxygen and vents the depleted water through his pores, taking advantage of his largest organ: his skin. For this to work, it would mean that his cells can regulate the osmotic process--the passage of gases through the cell membranes--in order to maintain a stable molecular density. That is, they let in oxygen and only oxygen. Perhaps, rather than cytoplasm, inside each cell is a membranous cushion of some highly vascular medium, allowing his blood to absorb the oxygen on cellular contact. I've been unable to attain viable cell samples at this point--Arthur doesn't want to be poked or prodded, and due to the acidity of sea water, my collected samples have mostly deteriorated. It will be interesting to see if any of my theories prove out.

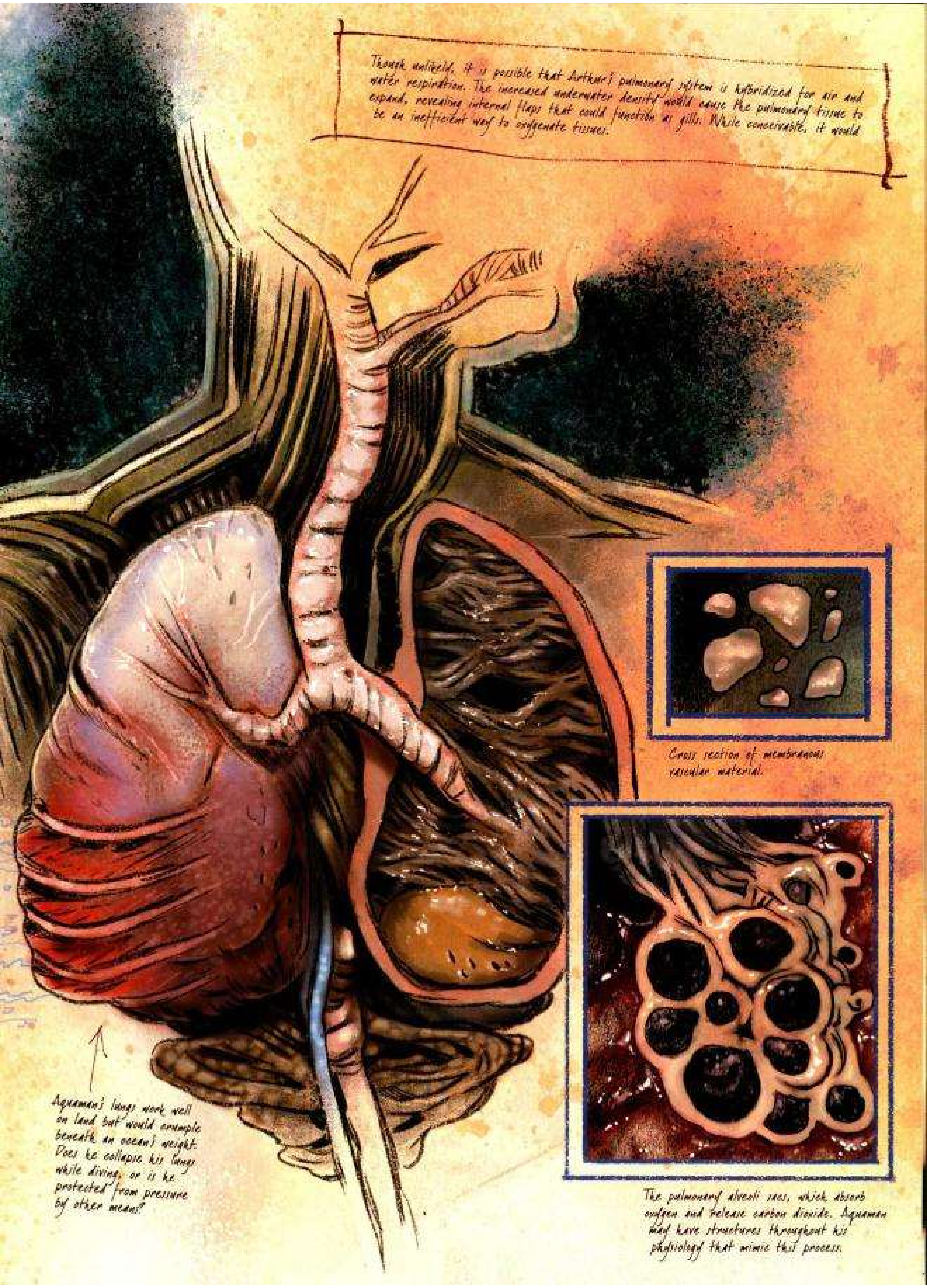
Is it possible that Aquaman respires through his pores?



Alternative sources for Aquaman genetic material? Use forensic tests on weapons of adversaries (Black Manta and Ocean Master)?



A gill-like cellular structure might be used to extract oxygen from water.



Though unlikely, it is possible that Arthur's pulmonary system is hybridized for air and water respiration. The increased underwater density would cause the pulmonary tissue to expand, revealing internal flaps that could function as gills. While conceivable, it would be an inefficient way to oxygenate tissues.

Cross section of membranous vascular material.

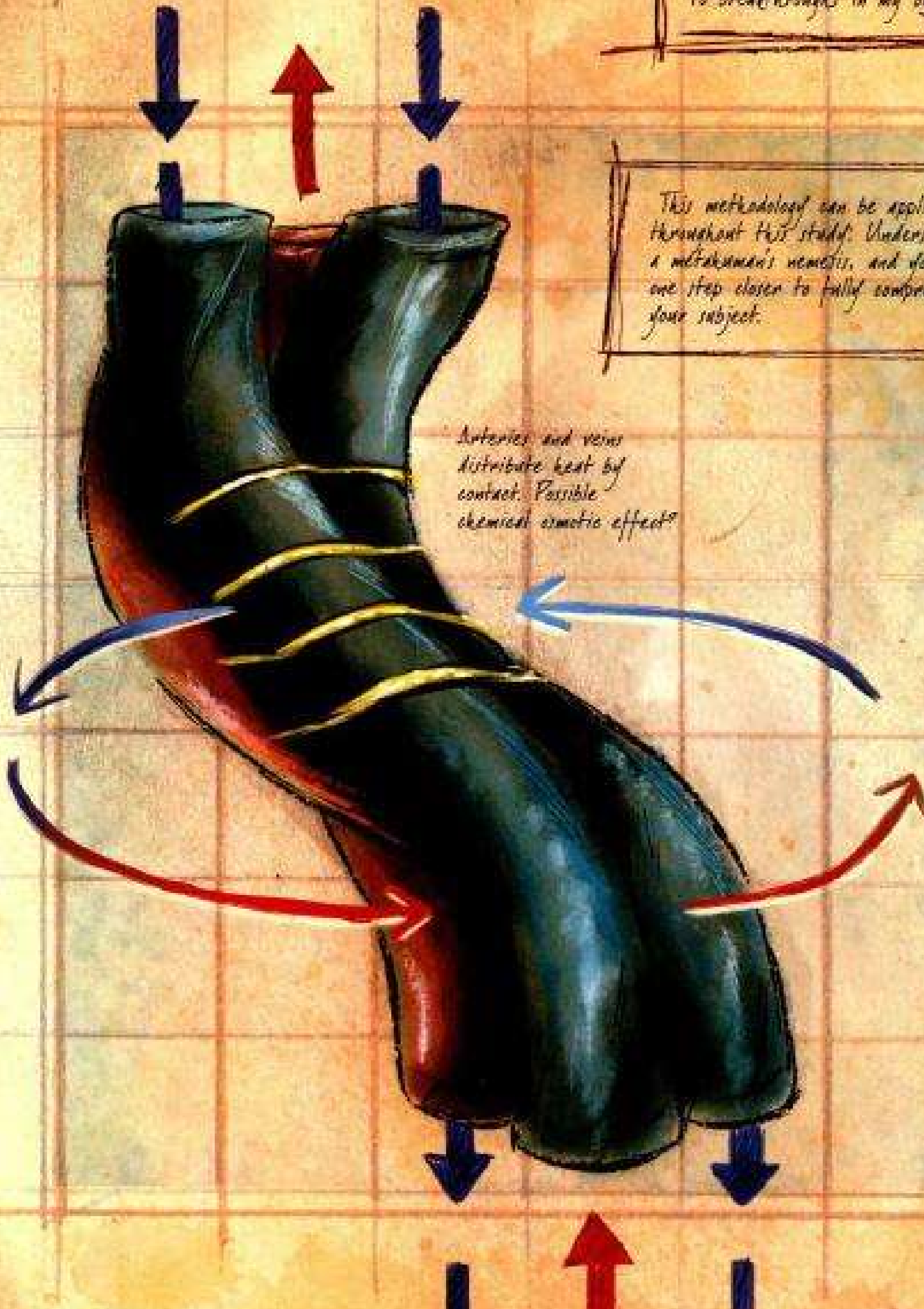
Aquaman's lungs work well on land but would crumple beneath an ocean's weight. Does he collapse his lungs while diving, or is he protected from pressure by other means?

The pulmonary alveoli sacs, which absorb oxygen and release carbon dioxide. Aquaman may have structures throughout his physiology that mimic this process.

COLD-BLOODED LIKE A FISH OR WARM-BLOODED LIKE A DOLPHIN? OR BOTH LIKE A GREAT WHITE?

NOTE FOR FURTHER STUDY:
I need to expand my study of specific metahumans to include each subject's key adversaries. Research into Aquaman's brother Orm Curry (aka Ocean Master) will no doubt yield insight into his sibling, and analysis of previous confrontations will provide valuable tactical data. Studies of Deep Six and King Shark may also be worthwhile. Likewise, a better understanding of the underwater apparatus that allows Black Manta to engage Aquaman in the depths of the ocean may lead to breakthroughs in my own aquatic equipment.

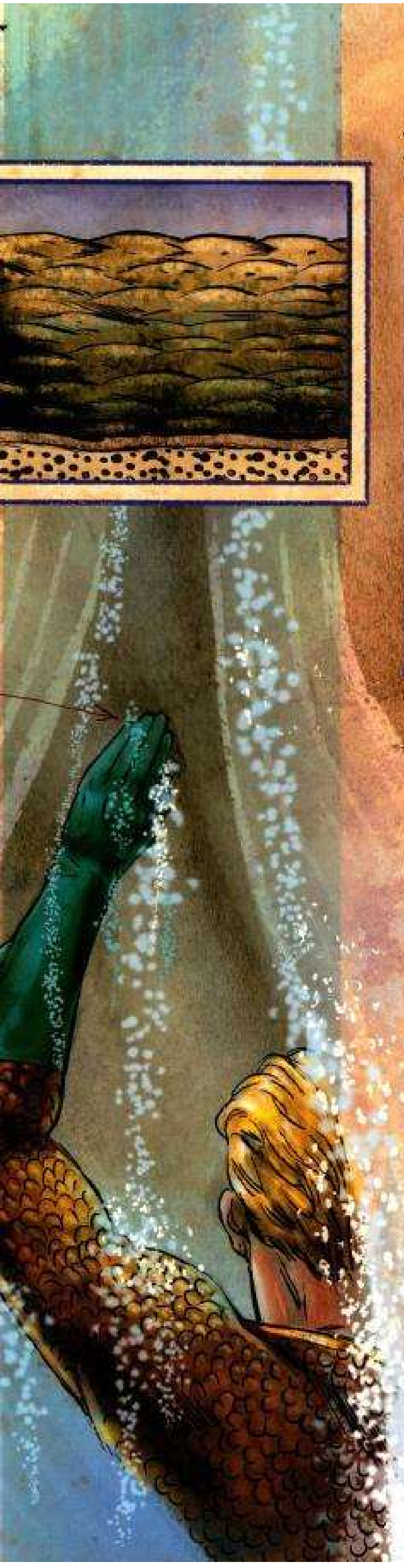
-Blood acts as a convective fluid in human bodies, transferring heat to be utilized or dispelled. Considering the complexity of maintaining a functioning systemic temperature at the bottom of an ocean trench, Aquaman's circulatory system must be exceptionally well regulated.



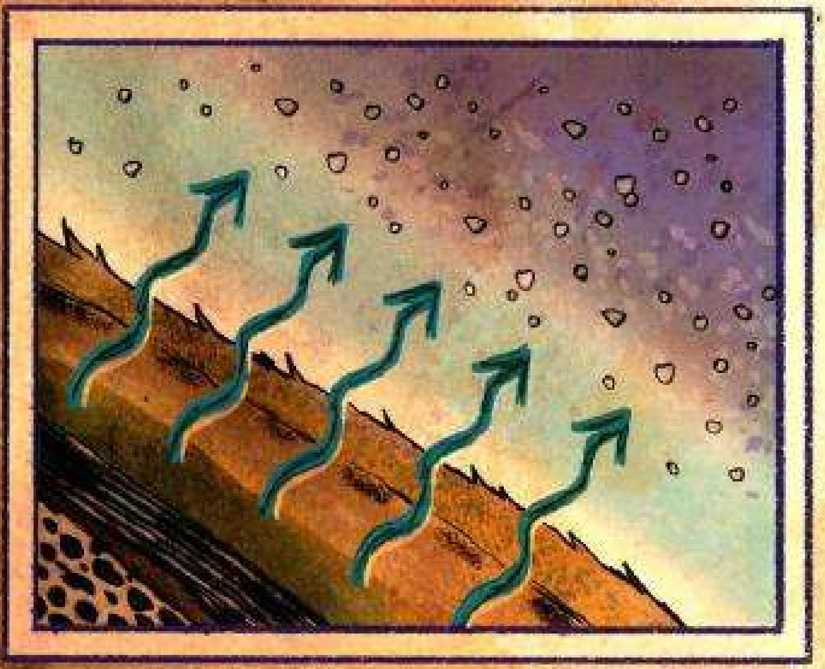
This methodology can be applied throughout this study. Understand a metahuman's nemesis, and you are one step closer to fully comprehending your subject.

Arteries and veins distribute heat by contact. Possible chemical osmotic effect?

Without fins or a tail, Aquaman nevertheless propels himself through water with uncommon agility, belying his humanoid form.



One theory is that the outermost layer of his skin is so dense that it simply does not transfer heat or cold. This would explain its incredible durability but runs counter to my theories about his ability to breathe underwater.



Cold and Pressure

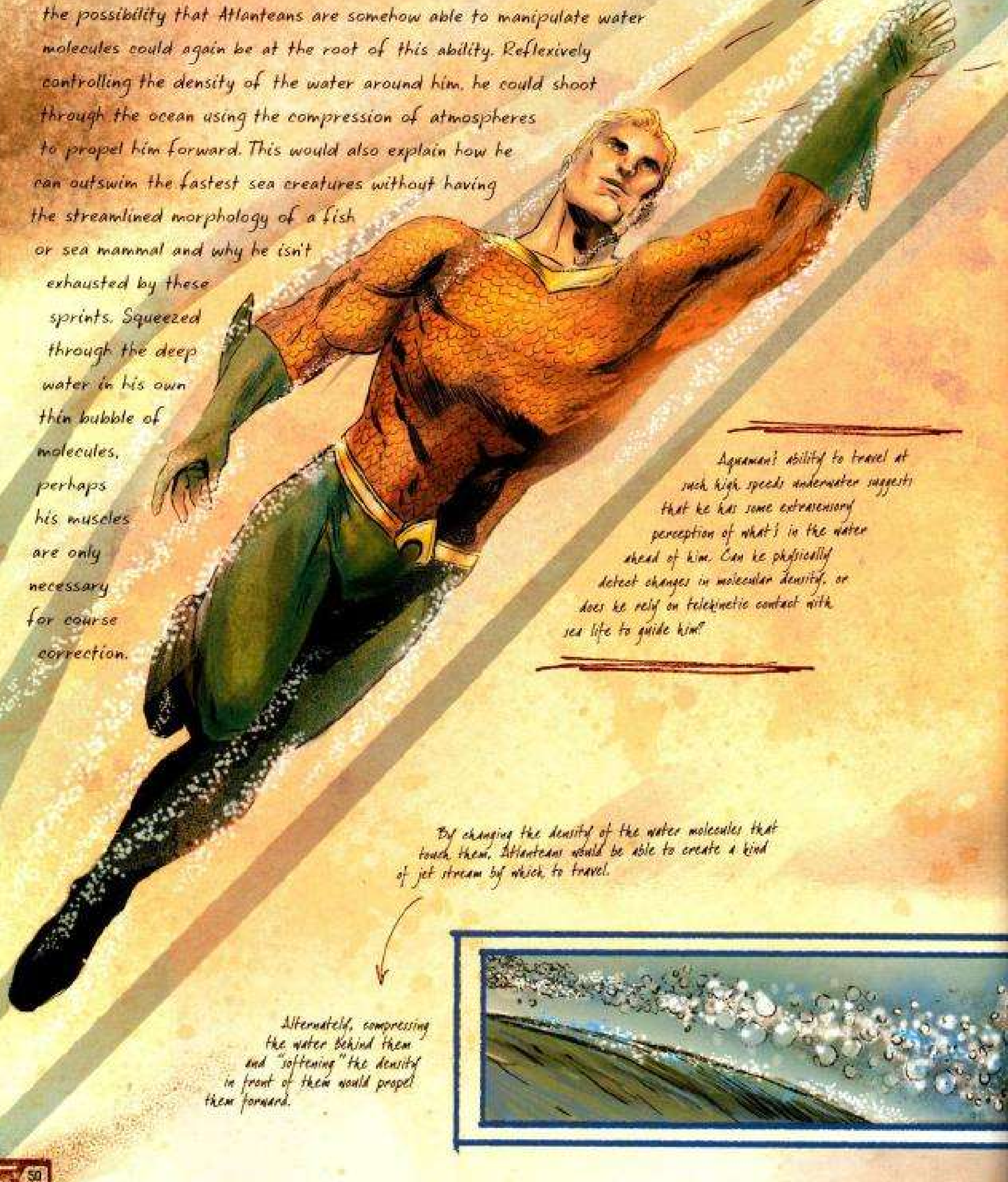
The ocean's depths are near freezing, yet Aquaman can move easily through even artic seas for extended periods of time. A countercurrent heat exchange mechanism--a process by which heat is transferred between arteries and veins to reduce heat loss--could account for some of his apparent invulnerability to hypothermia, but he doesn't have the body fat that most sea mammals require to survive that kind of cold.

It seems impossible that Aquaman can withstand the pressure of diving into the ocean's deepest trenches. Whales have been recorded diving to nearly 10,000 feet. Diving mammals have high levels of oxygen-binding proteins in their muscles so they can store oxygen. They also have collapsible lungs and lack frontal cranial sinuses, so they don't have air-filled cavities that might implode under pressure at great depths. Still, they can't stay down for long, only a matter of hours. Aquaman has gone three times as deep for much longer, withstanding more than two million pounds of pressure per square foot--and yet he appears to have human lungs and sinuses.

The only reasonable theory I can come up with is that Atlanteans, or rather their bodies, control water, at least to some degree. Mera, Aquaman's romantic partner, has conscious telekinetic control over water. Atlanteans of royal heritage possess similar psionic ability, but what if all Atlanteans have some autonomic function that allows them to control the water molecules immediately surrounding them to stay at a stable density and vibration? They could go to any depth at any temperature and not even become physically uncomfortable. It would be a natural response, similar to the way human skin contracts when it's cold or the way an otter secretes oil to keep its fur dry. A similar process may account for Aquaman's seemingly bulletproof skin--cellular control of the liquid in his epithelial cells. If he can withstand the deepest underwater trench's pressure, how would a bullet penetrate his skin? Perhaps on land, he unconsciously creates a high-density molecular shield from environmental humidity that keeps him protected from everything but the most severe trauma.

Speed

It appears that Aquaman can achieve speeds between Mach 5 and Mach 10, at least for brief periods of time. As unlikely as it seems, the possibility that Atlanteans are somehow able to manipulate water molecules could again be at the root of this ability. Reflexively controlling the density of the water around him, he could shoot through the ocean using the compression of atmospheres to propel him forward. This would also explain how he can outswim the fastest sea creatures without having the streamlined morphology of a fish or sea mammal and why he isn't exhausted by these sprints. Squeezed through the deep water in his own thin bubble of molecules, perhaps his muscles are only necessary for course correction.



Aquaman's ability to travel at such high speeds underwater suggests that he has some extrasensory perception of what's in the water ahead of him. Can he physically detect changes in molecular density, or does he rely on telekinetic contact with sea life to guide him?

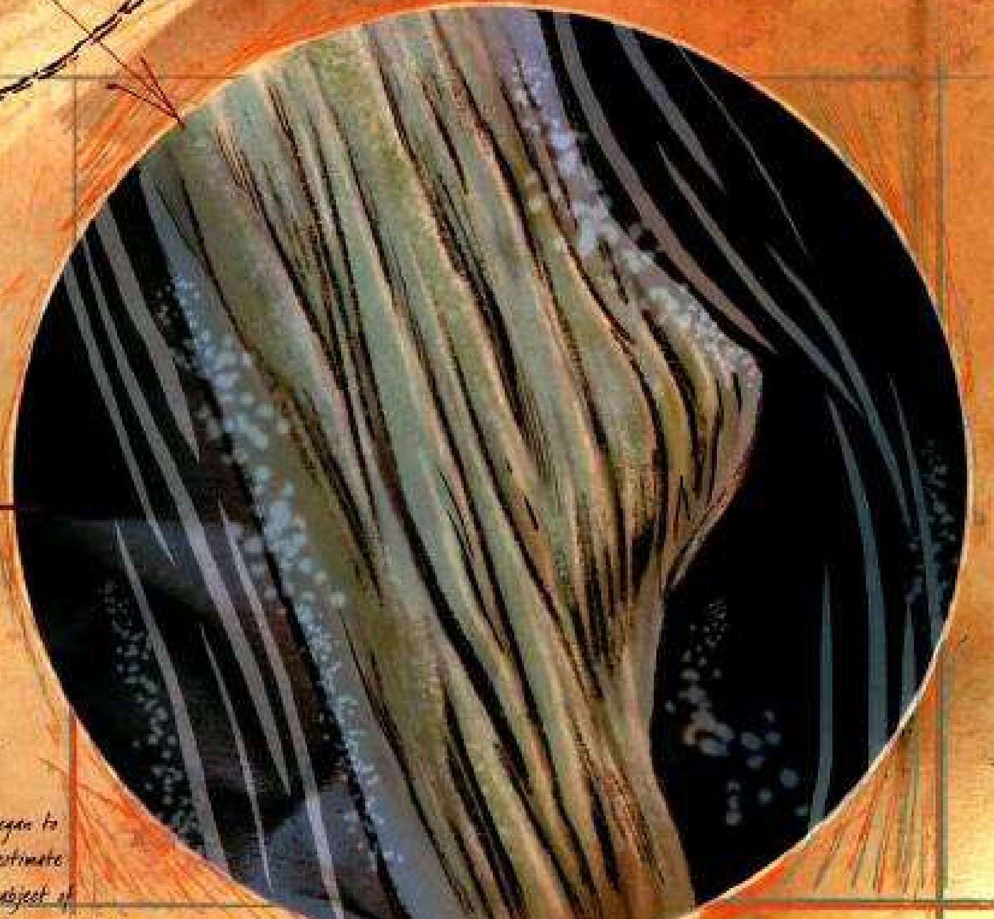
By changing the density of the water molecules that touch them, Atlanteans would be able to create a kind of jet stream by which to travel.

Alternately, compressing the water behind them and "softening" the density in front of them would propel them forward.

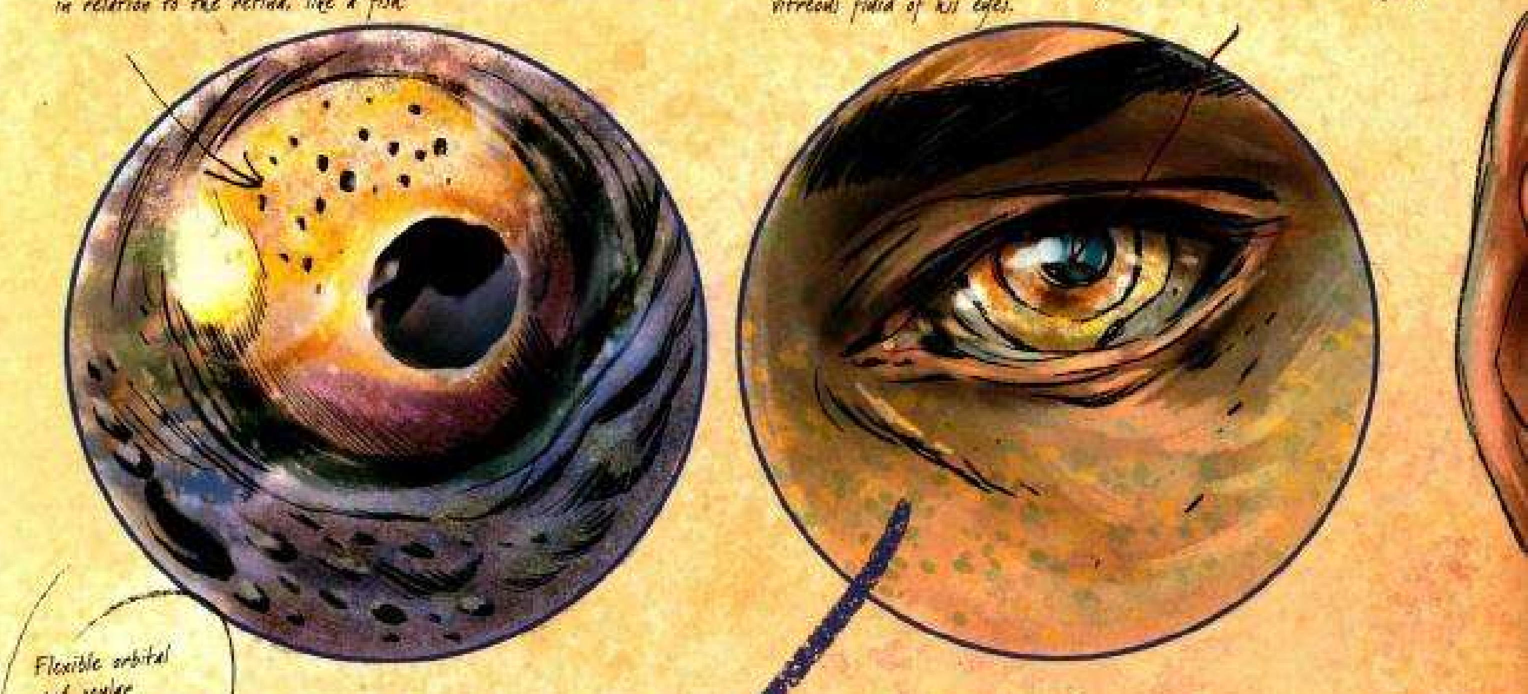
If Atlanteans can control the water molecules around them, this might explain how some were able to survive when their civilization sank.

My understanding of Aquaman's abilities would be greatly improved if he were to cooperate with my studies. Unfortunately, he has shown little willingness to become a test subject, an attitude not uncommon in those possessing powers that mark them as outsiders in our world. Over time I'm hoping he will learn to trust me and understand that these studies are vital, not only to our understanding of metahumans but to the defense of our world from malevolent forces. Of course, he is also intelligent enough to understand that my studies could put him at a disadvantage should conflict ever arise between us. Given the tensions between Atlanteans and the population of the wider world, I may have a long road to walk before I can convince him to participate.

Aquaman clearly doesn't have fins, but is it possible that he undergoes some specific dorsal or ventral muscular contraction while swimming in order to create microfinlike structures?

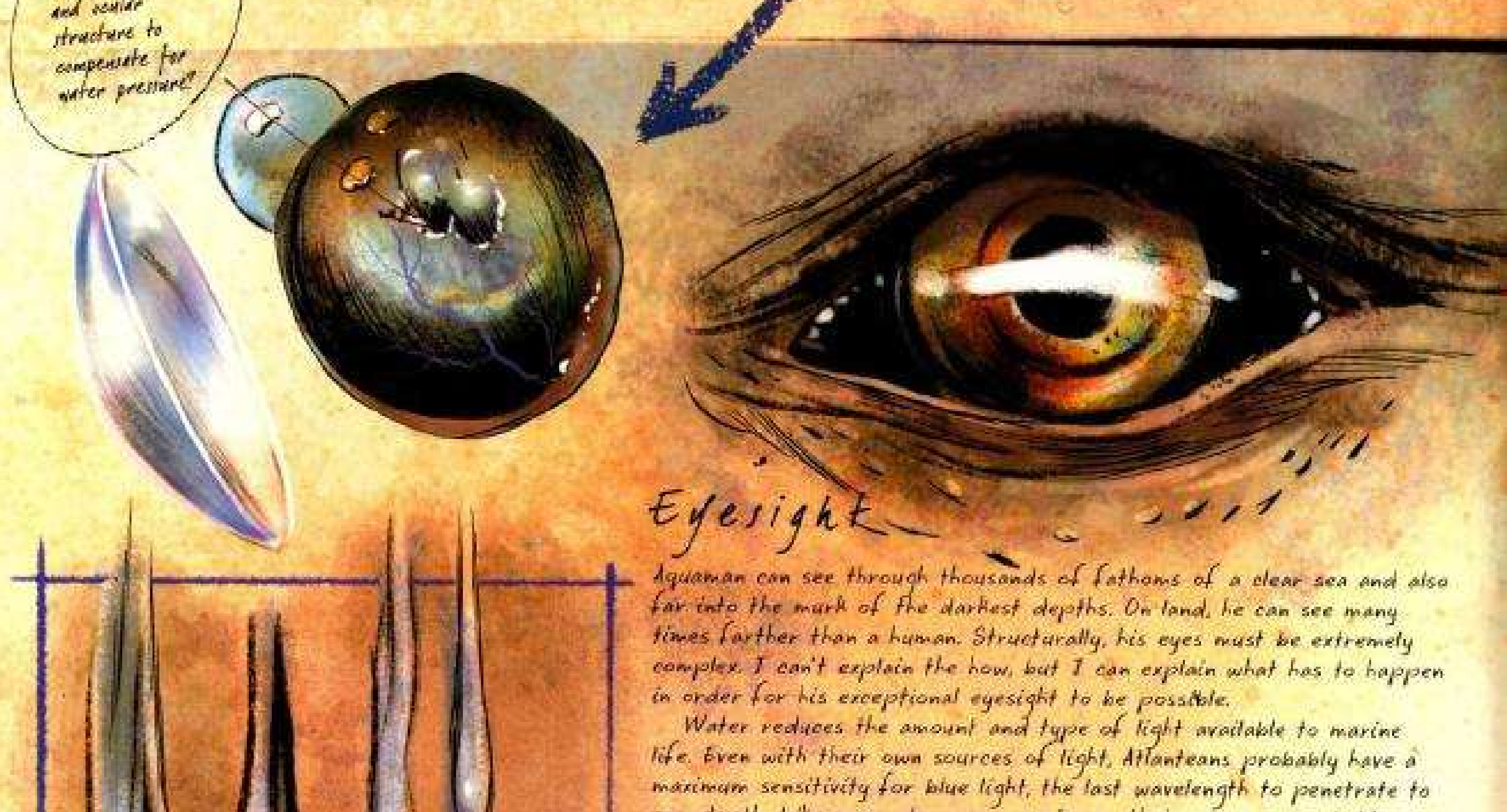


IMPORTANT NOTE: My research into metahumans leads me down many blind alleys and into arenas so speculative they can barely be considered science. Regardless, all possibilities, no matter how outlandish, must be considered before they can be dismissed. As part of what I call a "thought experiment," I began to visualize the fishlike appendages that I estimate would be required to physically propel a subject of Arthur's size through a body of water at the speed that he is able to travel. As Aquaman shows no sign of possessing fins and flippers, it would seem that the source of his abilities lies beyond the physical realm as we understand it. This process of elimination by speculation is laborious but slowly brings me closer to scientific truths.



The spherical lens of a fish eye. Does Aquaman focus by changing the shape of his eye's lens, like a human, or does he move the lens in relation to the retina, like a fish?

Given his ability to see clearly in multiple environments, Aquaman may also have some control over shifting lens structure or the viscosity of the vitreous fluid of his eyes.



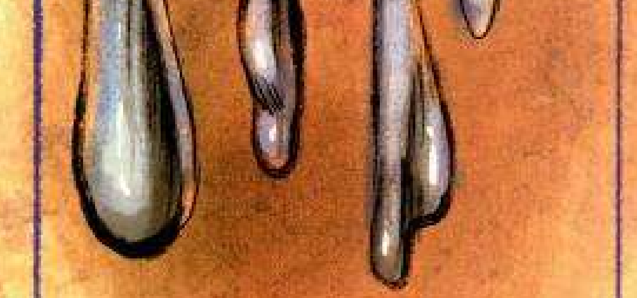
Flexible orbital and ocular structure to compensate for water pressure?

Eyesight

Aquaman can see through thousands of fathoms of a clear sea and also far into the murk of the darkest depths. On land, he can see many times farther than a human. Structurally, his eyes must be extremely complex. I can't explain the how, but I can explain what has to happen in order for his exceptional eyesight to be possible.

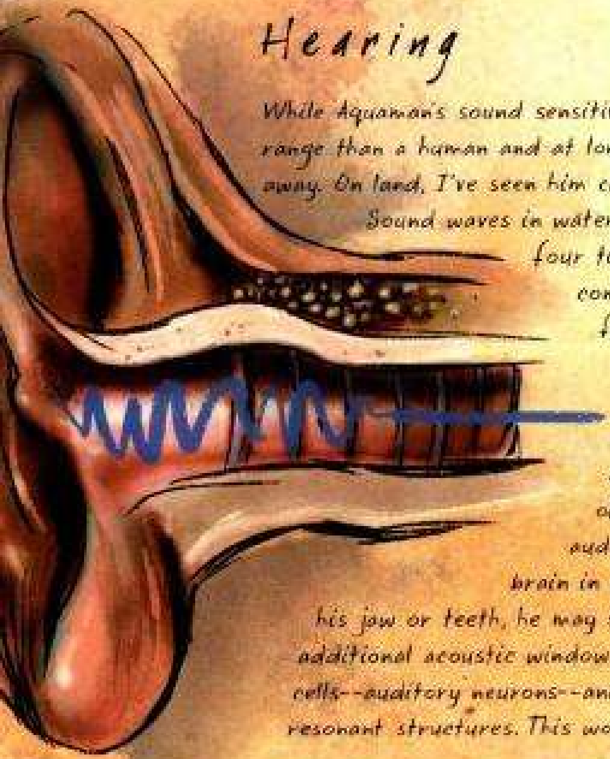
Water reduces the amount and type of light available to marine life. Even with their own sources of light, Atlanteans probably have a maximum sensitivity for blue light, the last wavelength to penetrate to any depth. Like many deep-sea creatures, their eyes are probably more oriented toward acuity than color reception, suggesting a proliferation of rod rather than cone photoreceptor cells. This would account for the exceptional clarity of Aquaman's night vision, although colors may not be as vivid to his eyes. There are a number of sea creatures that have developed photoreflective tissue behind their retinas that bounce available light back to the photoreceptors, increasing visual capability in dark water. It follows that the Atlantean optical system may have developed similarly.

So how does this explain his ability to see on land just as clearly? Extrapolating from the molecular manipulation theory, perhaps his eyes automatically compensate for the change in moisture and refraction of light when he leaves the water. Or maybe one of his human processes takes over, releasing tears--but of a variable viscosity, so that he can focus as needed. These gas-permeable "lenses" over his eyes could be adjusted at will, in essence forming adjustable contact lenses made of water.



GAS-PERMEABLE TEAR LENSES
A POSSIBILITY?

Hearing

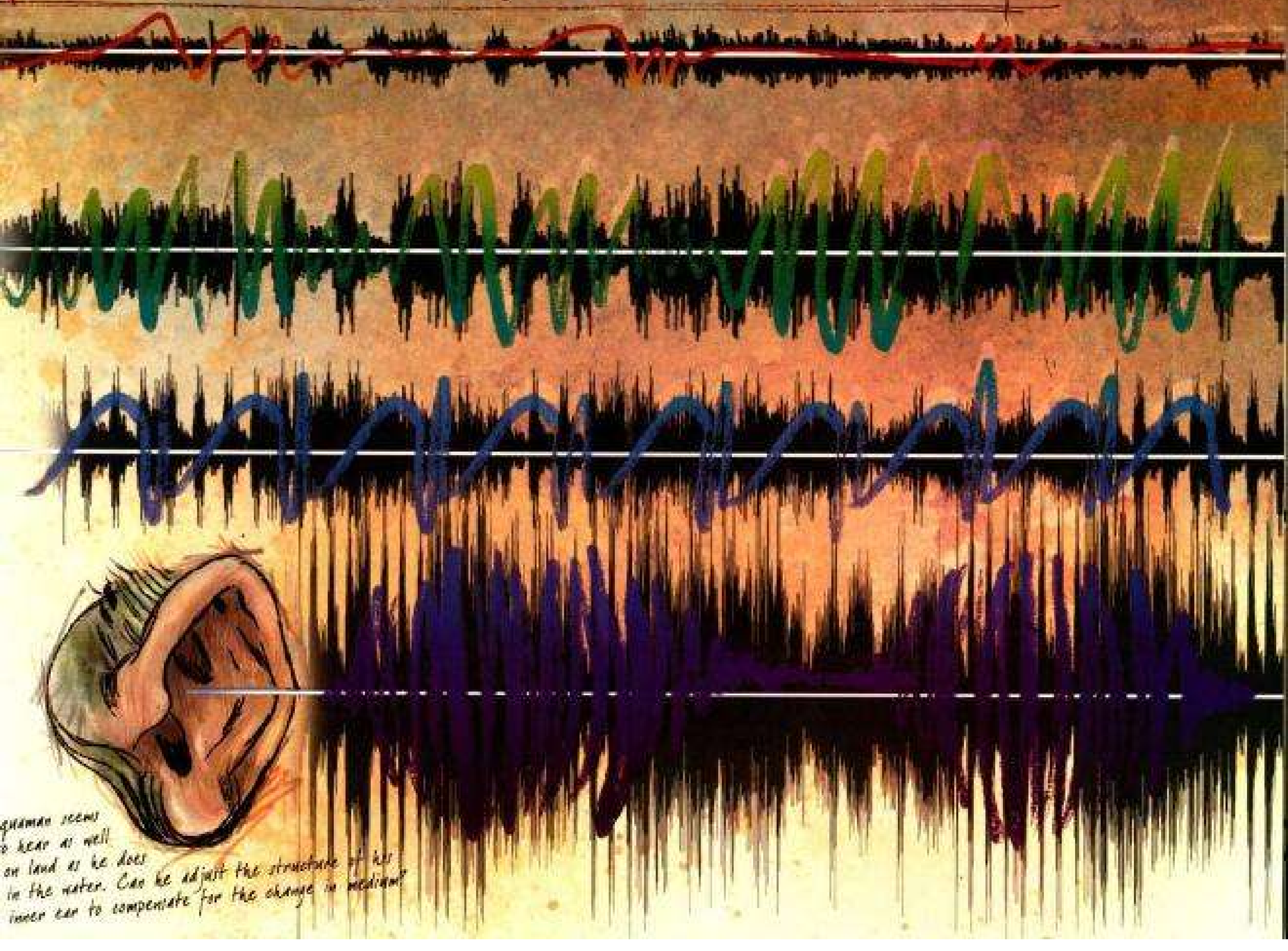


While Aquaman's sound sensitivity doesn't quite match Superman's, he can discern a much broader hertz range than a human and at longer distances. In the water, he can hear whales communicating half a world away. On land, I've seen him crippled by a sound too high for even my sensors to discern.

Sound waves in water work basically the same as in air, but under water, sound travels four times faster, due to the density of the carrier molecules. It also carries considerably farther without losing as much energy, refracting up and down from pressure and temperature changes at different depths.

Dolphins have some of the best hearing on this planet, partly because they can pick up a wide range of frequencies but also because they can interpret directionality under water. For humans under water, sounds diffuse, making locating the source of a sound difficult. Dolphins use parts of their jaws and teeth to funnel sound waves to their inner ear, where an auditory nerve three times thicker than a human's carries the vibrations to the brain in electrical impulses. While I don't believe that Arthur picks up sounds in his jaw or teeth, he may share the dolphin's ability to handle more complex auditory processing using additional acoustic windows near his ears. If true, he would also have a higher ratio of spiral ganglion cells--auditory neurons--and different thicknesses of the basilar membrane, one of the ear's primary resonant structures. This would allow him to receive and interpret a much broader range of hertz.

Sound travels in water much faster than in air and can span great distances depending on temperature and pressure. Arthur's ability to discern directionality far surpasses any human's.



quaman seems
o hear as well
on land as he does
in the water. Can he adjust the structure of his
inner ear to compensate for the change in medium?

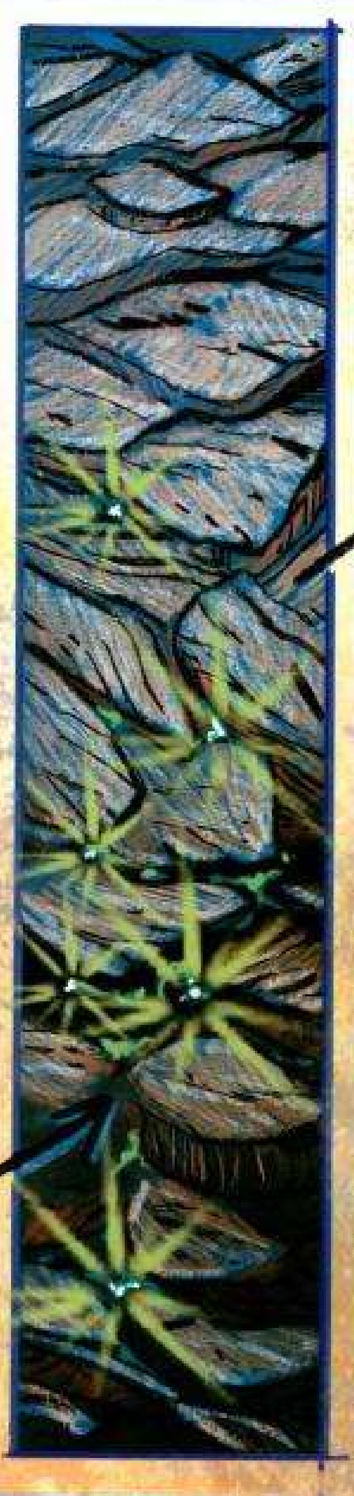
Telepathy

Arthur can communicate with nearly all types of marine animals, although, as he is quick to point out, most aren't capable of higher thought processes and don't "talk" like humans. It's my guess that he doesn't ask them to perform or request their help. Instead, he can direct them to action by manipulating their limbic systems, the part of the mind that controls instinct and drive. I once watched him sic a school of sharks on a tribe of water-dwelling monsters in order to save our group from a brutal attack. Either way, this ability to command sea creatures is extremely impressive and shouldn't be categorized as just "talking to fish."

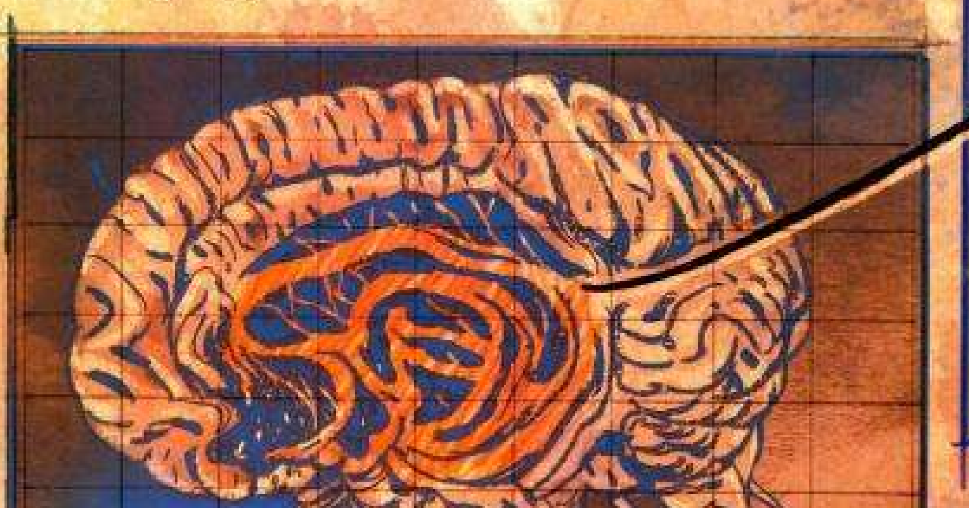
Considering the sheer number of living creatures in our oceans, this power is one of Aquaman's most useful. So how does it work? Again, I have to venture into hypothetical territory. I think it's interesting that some psionic abilities--including telepathy--already appear to be tied to the limbic system. Perhaps Aquaman's mind has a synaptic network that humans haven't evolved, one that can send electrical impulses to the minds of other animals. The creatures might then receive these impulses as transmissions from their own neurons. He doesn't need the medium of water to transmit these signals. He once saved the Justice League from attack while he was on land, which suggests that we're not observing a physiological exchange of energy. His ability seems to apply to all sea creatures, but is this because they've evolved in the water? Is there some link that connects these creatures we don't yet understand?

This leads us into territory where I'm not comfortable making hard and fast assertions. Psionic energy is real. Any number of metahumans possess psionic traits, from telekinesis to pyrokinesis to mind control, and while each individual came by his or her powers uniquely, is it possible--as some claim--that there is an elemental force that exists outside of human understanding, a force that can be tapped into and channeled? Or are the powers generated by specific physiological systems in each individual? While I generally err on the side of science, I don't currently have the tools to dissect external thought-to-thought communication. Thoughts carry energy; energy can be transferred. While I'd be interested to understand the science behind this particular trick, for now I can only accept that it occurs.

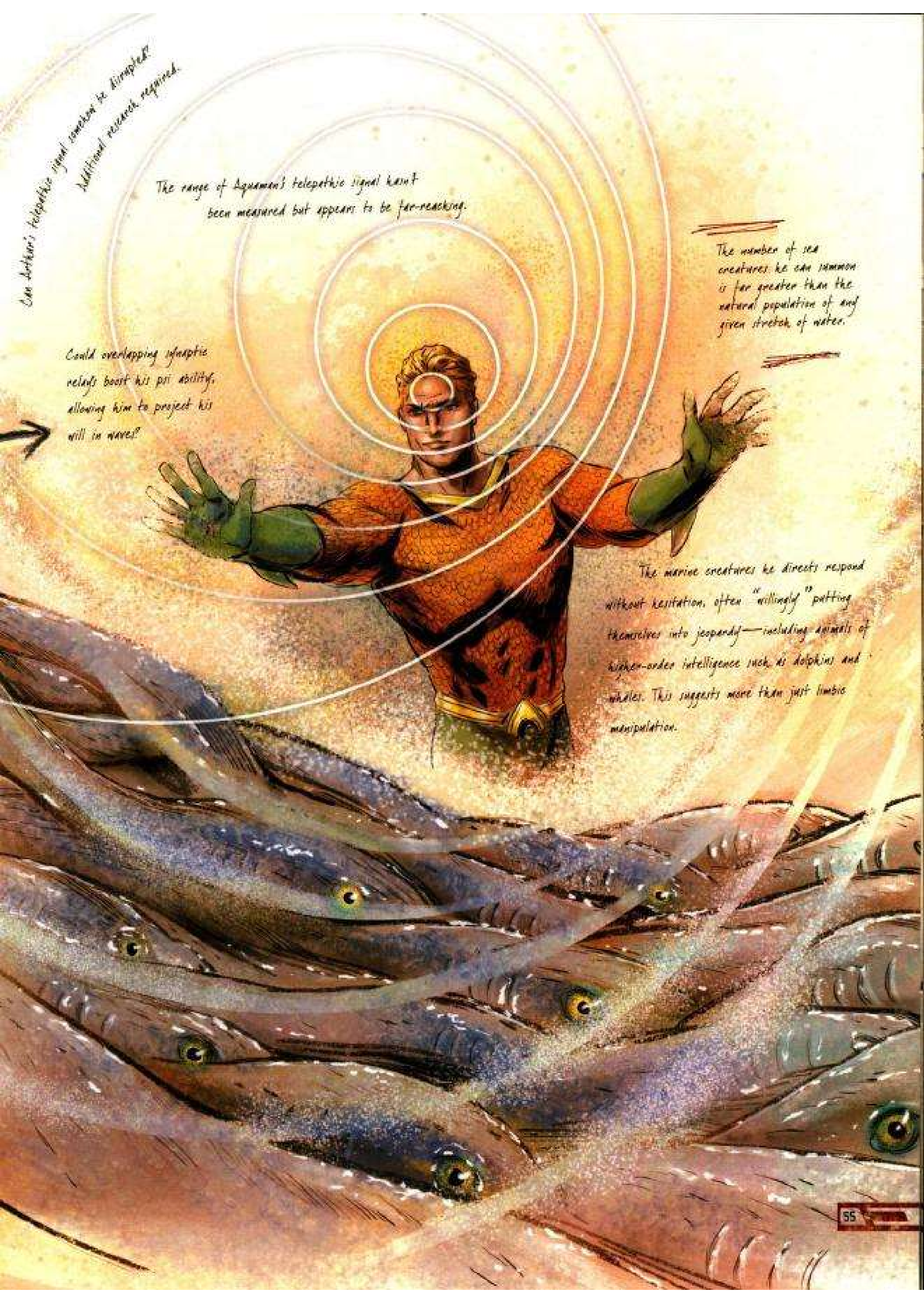
Like many other metahumans with telepathic ability, Arthur displays a highly developed cognitive empathy. He uses his ability humanely, minimizing risk to the animals he works with. He is a self-proclaimed protector of the oceans and their ebbing populations, so his ability to interact with marine life has its downside. His telepathic abilities often cause him physical and emotional pain, as he taps into the minds of creatures that are suffering or dying.



Mammalian cerebral structure on Earth doesn't have many variations, but something must account for Aquaman's specific and powerful telepathic abilities. I've speculated a kind of internal echo chamber for his transmissions, possibly a physical structure that reflects and builds each telepathic suggestion to maximize its strength.



Can Arthur transmit electrical impulses into the minds of sea creatures to make them perform? Or does he "suggest" behaviors based on instinctual drives?



Can Arthur's telepathic signal somehow be disrupted?
Additional research required.

The range of Aquaman's telepathic signal hasn't been measured but appears to be far-reaching.

The number of sea creatures he can summon is far greater than the natural population of any given stretch of water.

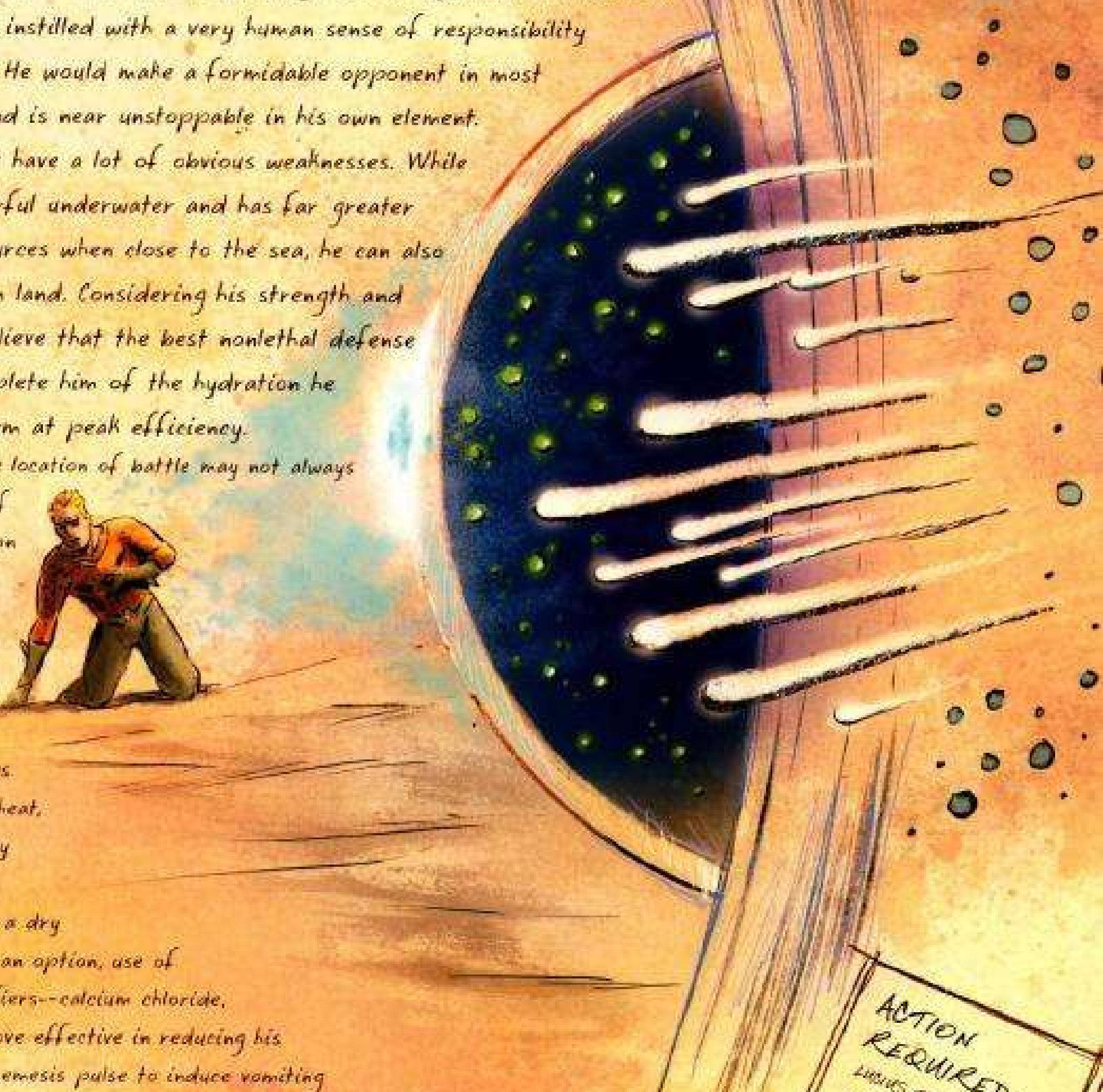
Could overlapping synaptic relays boost his psi ability, allowing him to project his will in waves?

The marine creatures he directs respond without hesitation, often "willingly" putting themselves into jeopardy—including animals of higher-order intelligence such as dolphins and whales. This suggests more than just limbic manipulation.

Weaknesses

Considering how little hard data I currently have on Aquaman, I'm relieved that Arthur was instilled with a very human sense of responsibility at a young age. He would make a formidable opponent in most environments and is near unstoppable in his own element. Aquaman doesn't have a lot of obvious weaknesses. While he's most powerful underwater and has far greater access to resources when close to the sea, he can also function well on land. Considering his strength and endurance, I believe that the best nonlethal defense would be to deplete him of the hydration he needs to perform at peak efficiency.

Controlling the location of battle may not always be possible, but if for some reason an Atlantean were to become a threat, drawing them away from the water would be an obvious strategy. In a dry heat, Aquaman will quickly lose his advantages. If confrontation in a dry environment is not an option, use of chemical dehumidifiers--calcium chloride, silica gel--may prove effective in reducing his resources. A sonic emesis pulse to induce vomiting would increase his dehydration levels.



ACTION REQUIRED:
LUCIUS TO PURCHASE CALCIUM CHLORIDE AND SILICA GEL IN BULK QUANTITIES AND BEGIN IMMEDIATE WEAPONIZATION RESEARCH.

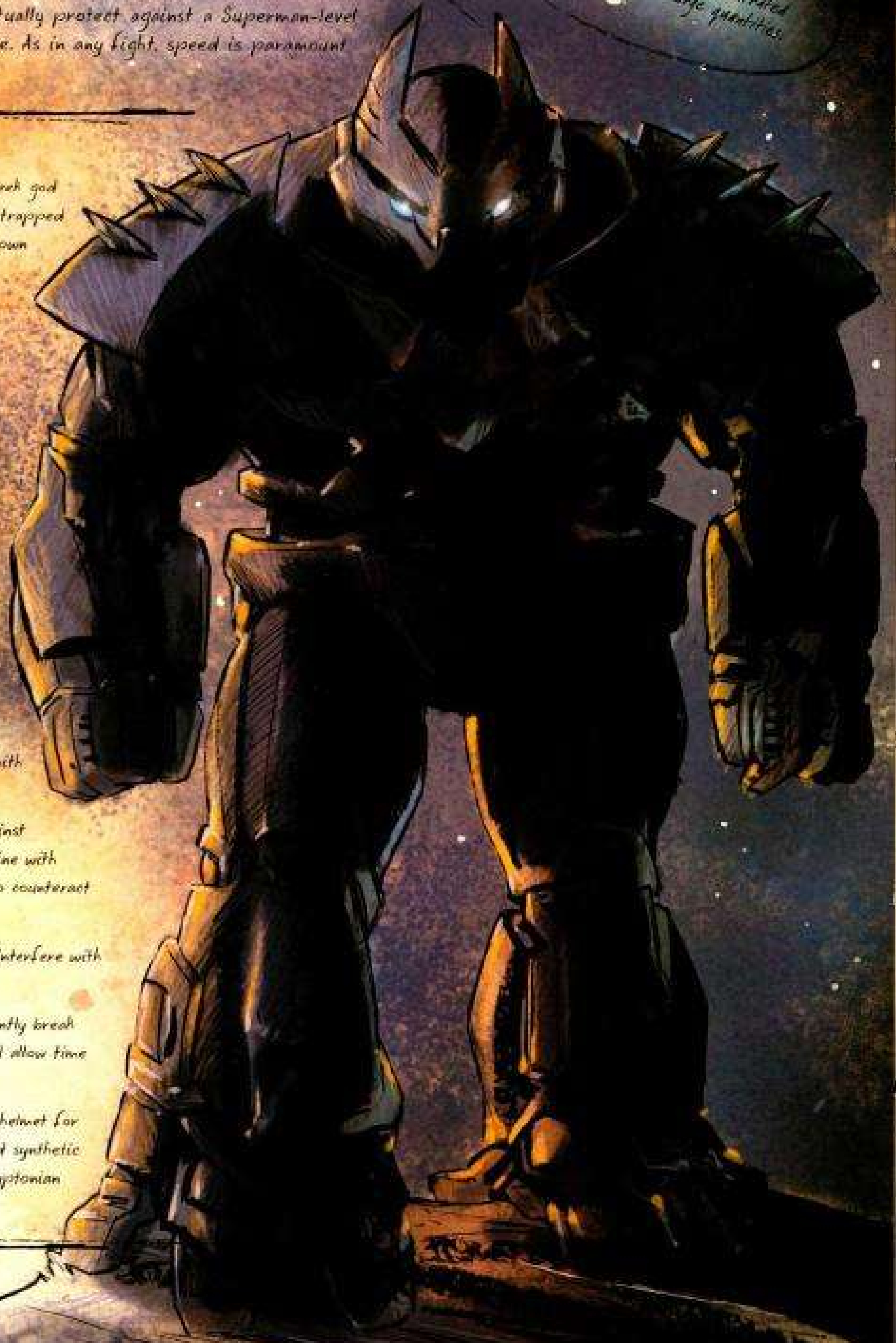
Aquaman has proven loyal to his human ancestry, but he and I have occasionally butted heads while working together in the Justice League. Arthur is used to being king. He feels justifiably qualified to step up to a leadership position, and while I don't deny his talents, I feel his sense of infallibility can sometimes make him too quick to act. Still, he's a viable candidate to lead when needed. His instinct is always to make the most humane decision possible in any given circumstance, a quality that not every metahuman--or human, for that matter--prioritizes.

Buster

Easily the most powerful suit in my armory, and also the most expensive, the Justice Buster model is to be used only in an absolute endgame scenario. Specifically designed to tackle the powers and abilities of the Justice League, the armor can actually protect against a Superman-level attack, yet only for a limited time. As in any fight, speed is paramount when dealing with the League.

FEATURES INCLUDE:

- Bind of Veils Relic: Woven by Greek god Hephaestus. Causes wearer to be trapped in a fantasy world of his or her own making. To be used on Wonder Woman if needed.
- Auto-Release Frictionless Coating: To counteract Flash's speed, making nearby surfaces too slick to gain traction.
- Powdered Magnesium Carbonate Foam: Absorbs moisture from its target. Perfect for containing and weakening Aquaman.
- Red Giants: Miniaturized red suns collected from dying universes with the help of the technology of Dr. Ray Palmer. Inserted into knuckle pods for best chance at trading punches with Superman.
- Plasma Shields: Should guard against Superman's heat vision. Can combine with thrust and thermal capabilities to counteract freeze breath.
- Electromagnetic Nerve Tree: Will interfere with Cyborg's more delicate systems.
- Citrine Neutralizer: Used to instantly break Green Lantern's concentration and allow time for counterattack.
- Kryptonite Gum: Stored in suit's helmet for last-ditch effort. Butadiene-based synthetic rubber laced with radioactive Kryptonian dust.



ONGOING RESEARCH: Adapt Batboat to fire torpedoes that can deliver concentrated magnesium carbonate foam in large quantities.

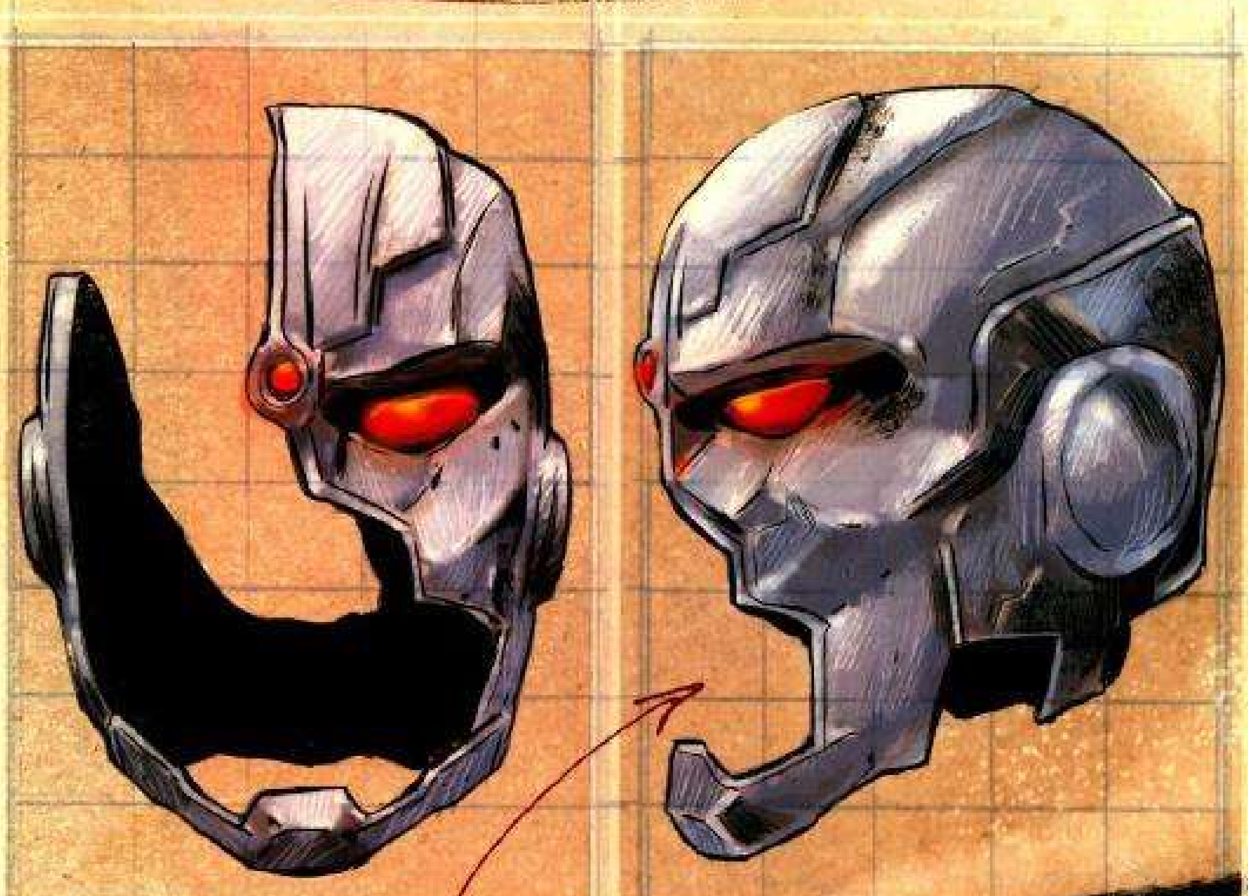
CYBORG

Victor Stone, son of eminent scientist Dr. Silas Stone, was a high school football player considering scholarship offers when he was caught up in Darkseid's initial attack on Earth. He was horribly burned and near death when his father used some of S.T.A.R. Labs' advanced technology to save his life. Now known by the designation Cyborg, Victor is literally more machine than human, made up of promethium skin grafts, metal ceramic alloys, and uploaded nanites--microscopic molecular computers that can be controlled by conscious thought.

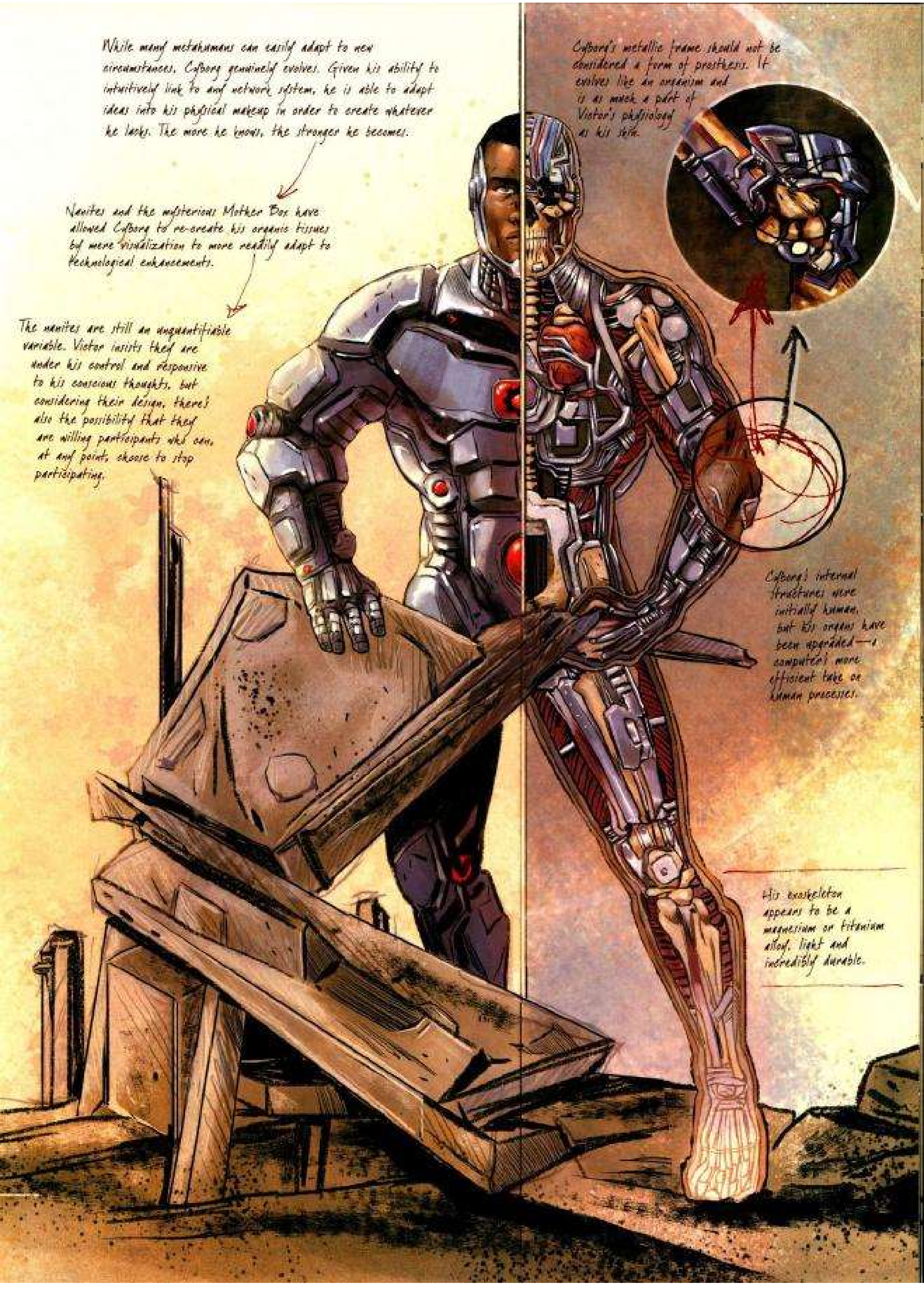
A healthy human athlete melded with a powerful, weaponized android body, Victor was also given the ability to communicate with any computer-based system, which, in this world, is no small advantage. The S.T.A.R. Labs tech reformed nearly every one of his cells, creating perfect connectivity between the organic and inorganic. As traumatic as his near death and transition must have been, Cyborg is unquestionably a technical marvel--a seamless balance of disparate parts, made even more powerful by the acquisition of an otherworldly living computer known as a Mother Box.

At this time, Cyborg has undergone a series of upgrades that deny easy scientific explanation. The nature of these various advancements is so far beyond Earth technology that I can't really speculate on them. I don't see any choice, however, considering his potential for being remotely controlled by villainous outside sources. His recent possession by the villainous entity Grid clearly demonstrated the need for as complete an understanding as possible of how this cybernetic man functions.

Cyborg's headpiece protected Victor's human flesh following his transition and replaced his missing eye with a multitude of adaptive visual processes.



Does exposed area in headpiece represent a possible weak spot? Is exposed skin vulnerable? Is it even skin or just synthetic facsimile?



While many metahumans can easily adapt to new circumstances, Cyborg genuinely evolves. Given his ability to intuitively link to any network system, he is able to adapt ideas into his physical makeup in order to create whatever he lacks. The more he knows, the stronger he becomes.

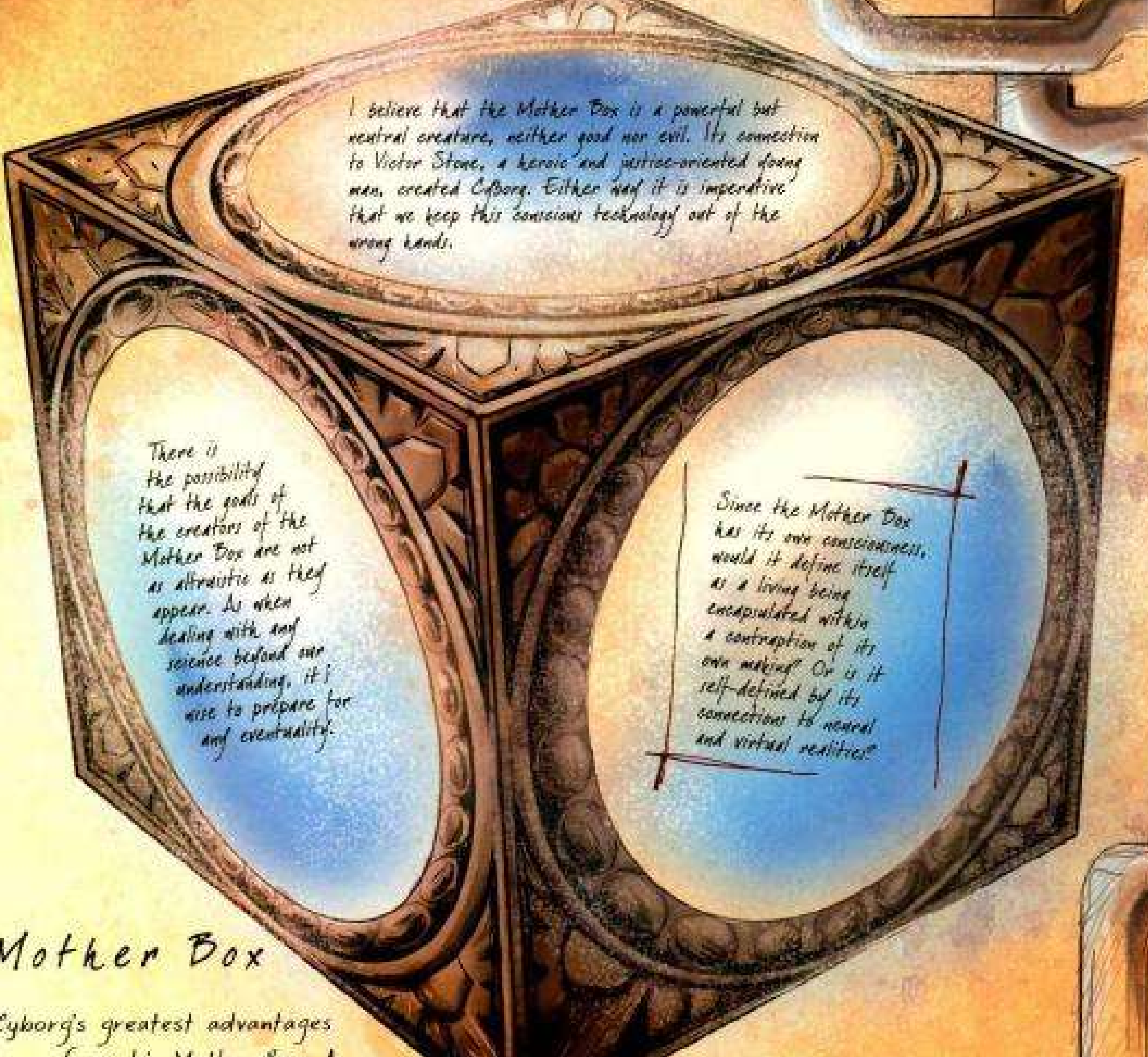
Nanites and the mysterious Mother Box have allowed Cyborg to re-create his organic tissues by mere visualization to more readily adapt to technological enhancements.

The nanites are still an unquantifiable variable. Victor insists they are under his control and responsive to his conscious thoughts, but considering their design, there's also the possibility that they are willing participants who can, at any point, choose to stop participating.

Cyborg's metallic frame should not be considered a form of prosthesis. It evolves like an organism and is as much a part of Victor's physiology as his skin.

Cyborg's internal structures were initially human, but his organs have been upgraded—a computer's more efficient take on human processes.

His exoskeleton appears to be a magnesium or titanium alloy, light and incredibly durable.



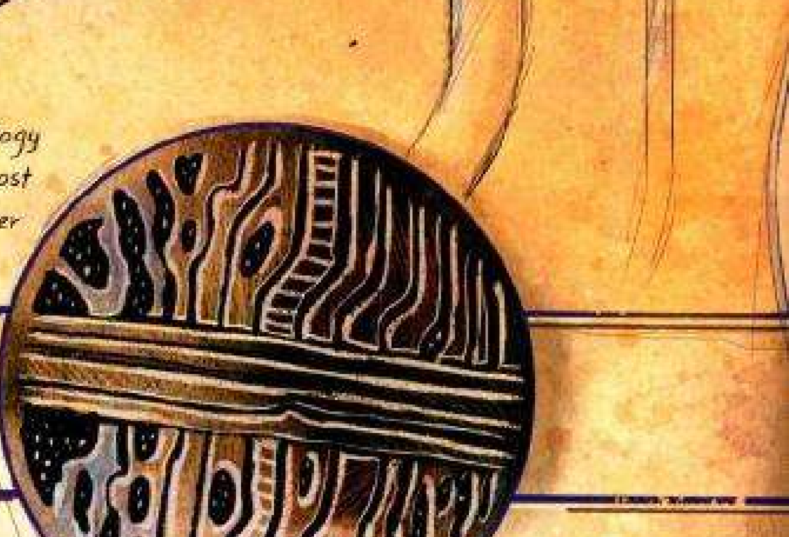
I believe that the Mother Box is a powerful but neutral creature, neither good nor evil. Its connection to Victor Stone, a heroic and justice-oriented young man, created Cyborg. Either way it is imperative that we keep this conscious technology out of the wrong hands.

There is the possibility that the gods of the creators of the Mother Box are not as altruistic as they appear. As when dealing with any science beyond our understanding, it's wise to prepare for any eventuality.

Since the Mother Box has its own consciousness, would it define itself as a living being encapsulated within a contraption of its own making? Or is it self-defined by its connections to neural and virtual realities?

Mother Box

Cyborg's greatest advantages come from his Mother Box. A living computer that originated on the planet New Genesis, the Mother Box is decades more advanced than any technology on Earth. Having merged with Victor's Cyborg form almost immediately after his reconstructive surgery, the Mother Box allows Victor to teleport via its built-in Boom Tube--an extra-dimensional point-to-point travel portal--and creates synergy in the coordination of his highly advanced physical systems, from sensory input to cellular tissue formation. A fascinating piece of technology with a built-in consciousness, the Mother Box is actually able to feel pain and can be "killed" if damaged irreparably. The long-term effects of this meld between human and device have yet to be charted--another reason to keep a careful watch, for Stone's safety as well as our own.



S.T.A.R. Laboratories
Scientific and Technological Advanced Research
Cyborg Project

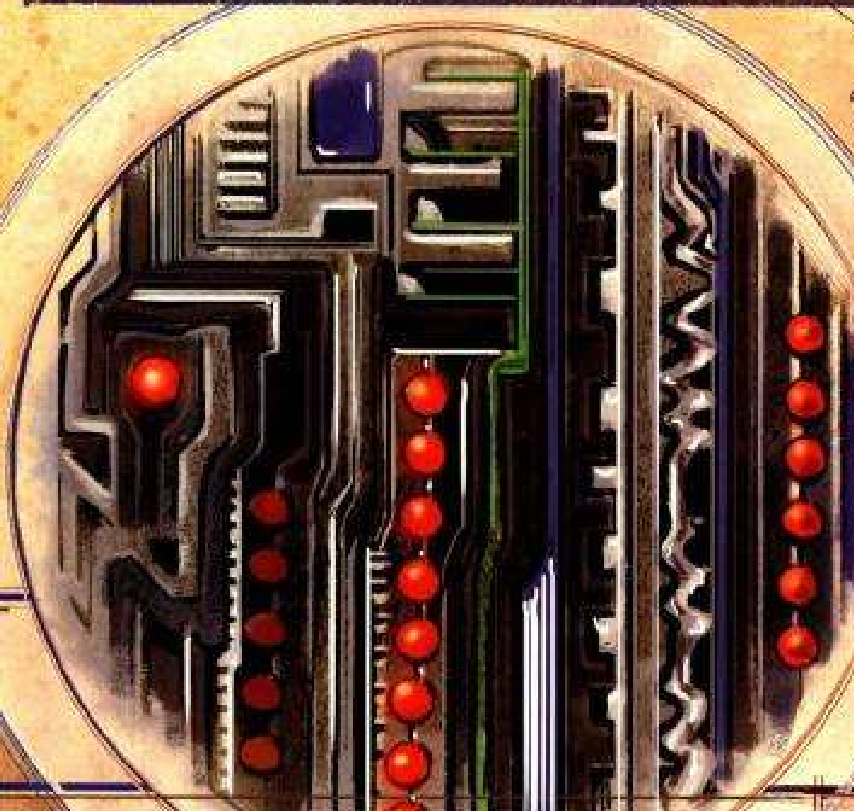
Early tests of the promethium graft have exceeded our original estimates by a large margin. As hoped, the subject has not only merged seamlessly with the incredibly durable artificial metal, but has also shown little to no need for a recovery period after the initial procedure.

The promethium almost instantaneously replaced the damaged tissue in the subject's body, causing him a high degree of transient pain for less than ninety seconds (his wounds would have been fatal, had we not proceeded with the experimental process). The subject's vitals then stabilized, and the A-Maze Operating System initiated, delivering endorphins to his brain along with an informational download.

With his cybernetic operating system originally set to auto-command, the subject was able to ease into his new abilities, instinctively activating defense systems when the need arose. While I would have liked to have thoroughly examined the subject as soon as the process was complete, circumstances necessitated otherwise; no concrete data was established until nearly a week after the fact. See related Promethium/Cyborg update log 001.3 through 001.8 for later findings.

Dr. Silas Stone
Red Room
Level 7
Detroit, Michigan

When faced with the death of his child, Dr. Stone took a desperate chance, one that has undoubtedly caused conflict between the esteemed scientist and his son. Unfortunately, S.T.A.R. Labs is not open to sharing their data on either promethium or the A-Maze Operating System.



Mixture of organic and synthetic circuitry?

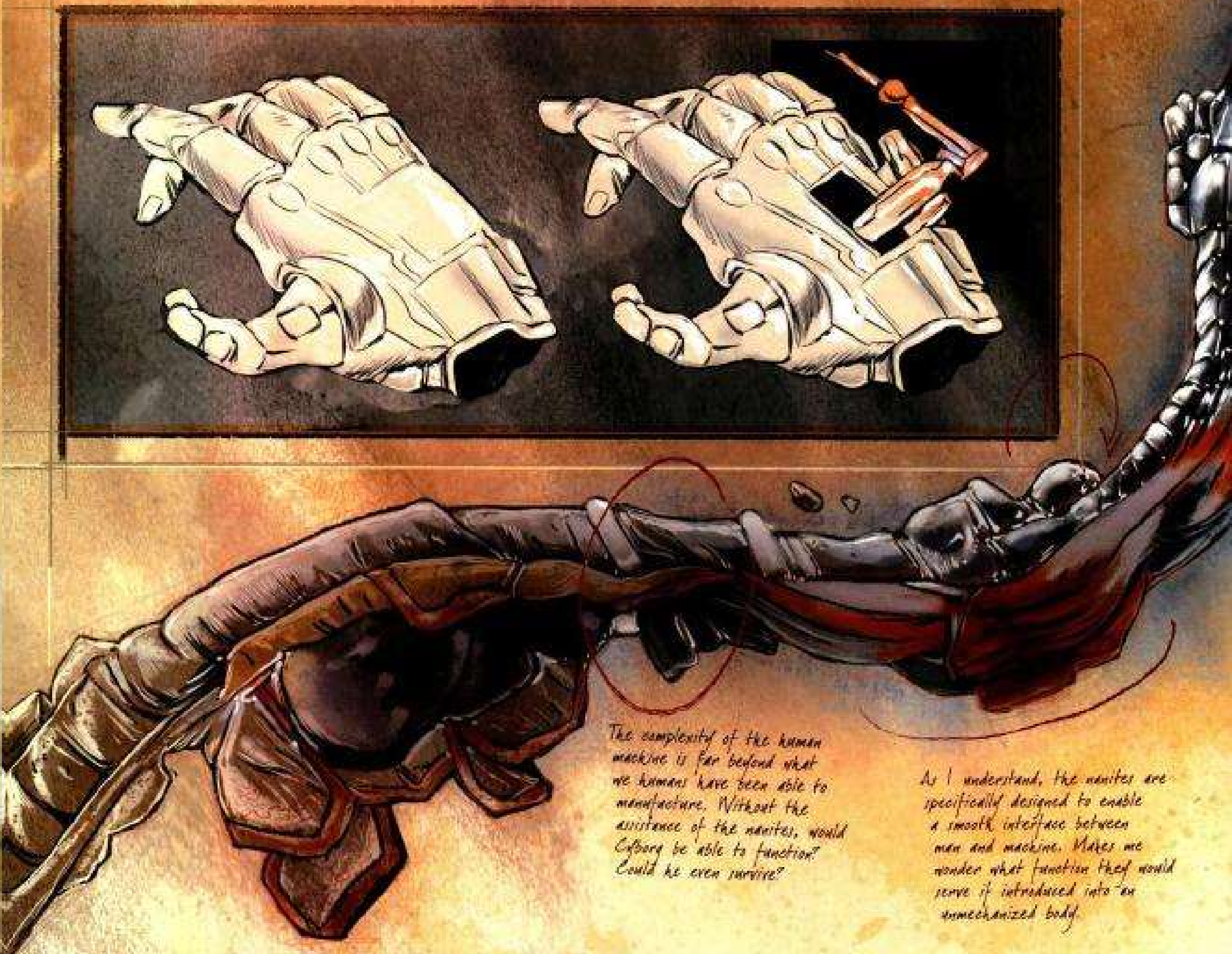
REMINDER: As mentioned previously, do not attempt to store this document digitally. Although I have great confidence in the Batcave's digital security protocols, the power gifted to Cyborg by the Mother Box is vast and at this stage largely uncharted. We must proceed with extreme caution.

Is the consciousness in the Mother Box contained within the circuits, or does it exist alongside them?

Incarnations

My first introduction to Cyborg happened shortly after his initial transformation. Dr. Silas Stone was more interested in saving his son's life than worrying about the particulars of Cyborg's design, but even having studied the found alien technology at S.T.A.R. Labs, the cybernetic reconfiguration of Victor's body surpassed Silas's highest expectations. Afraid that Victor's burned body would reject the skin grafts and experimental bionics, Silas injected his son with untested nanites, microscopic mechanisms designed to control cellular processes. Victor's organic mind interfaced with the billions of nanites, reforming his flesh and regenerating lost tissue into new, upgraded forms. Most of his body appeared metallic, cybernetic, with only his right eye and portions of his face and head still visibly human. Experimental operating programs were uploaded into Victor's neurons, the nanites creating a synaptic router that could monitor incoming signals and commands.

The nanites continue to improve and upgrade, thereby giving Cyborg control over his physical form. Presently, he is able to form weapons out of his appendages, which makes him a formidable fighter in almost any battle.

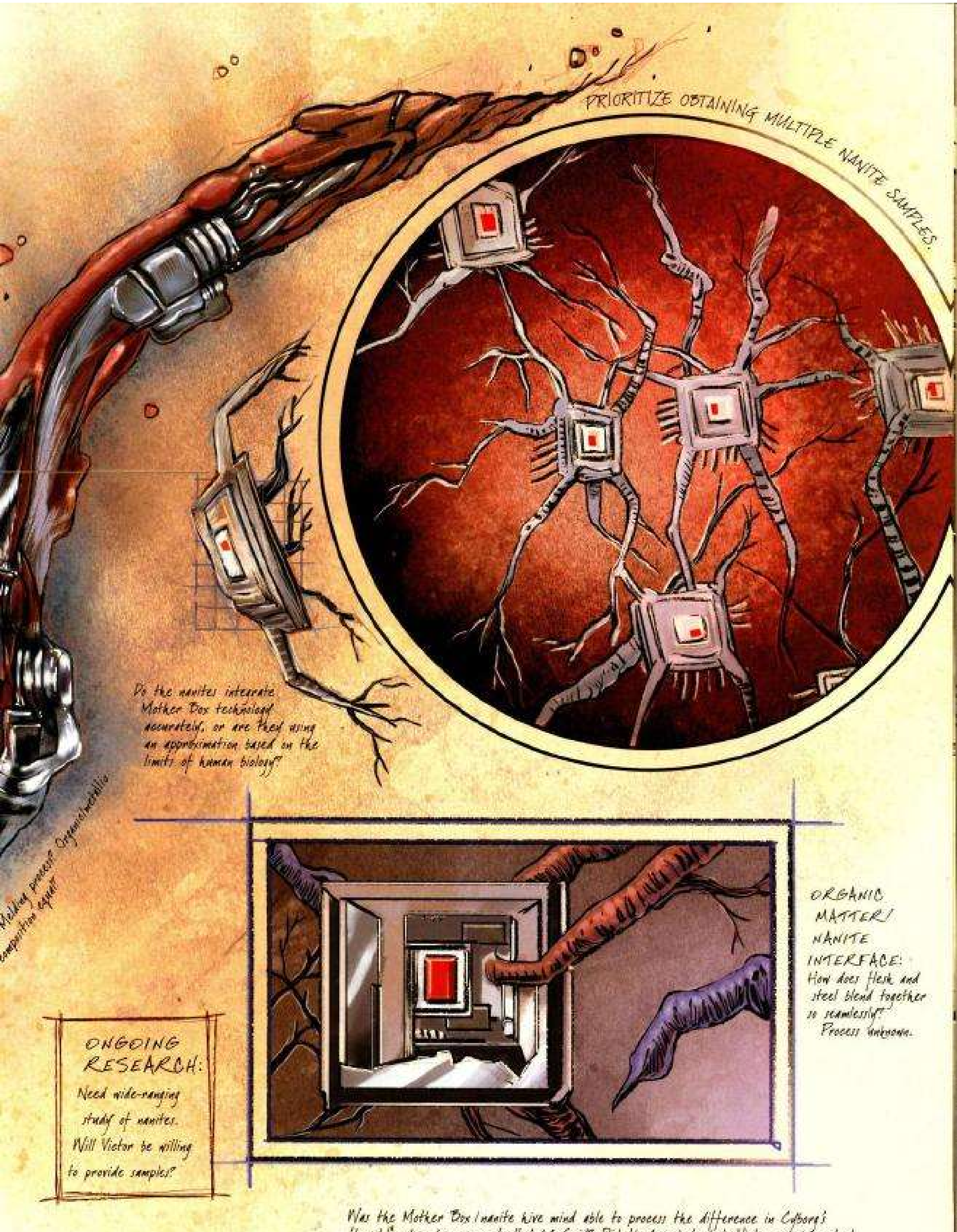


The complexity of the human machine is far beyond what we humans have been able to manufacture. Without the assistance of the nanites, would Cyborg be able to function? Could he even survive?

As I understand, the nanites are specifically designed to enable a smooth interface between man and machine. Makes me wonder what function they would serve if introduced into an unmechanized body.

Could nanite technology be incorporated into my crime-fighting arsenal?

Weapons that evolve to tackle new threats? Too risky? Or inevitable next step?



PRIORITIZE OBTAINING MULTIPLE NANITE SAMPLES.

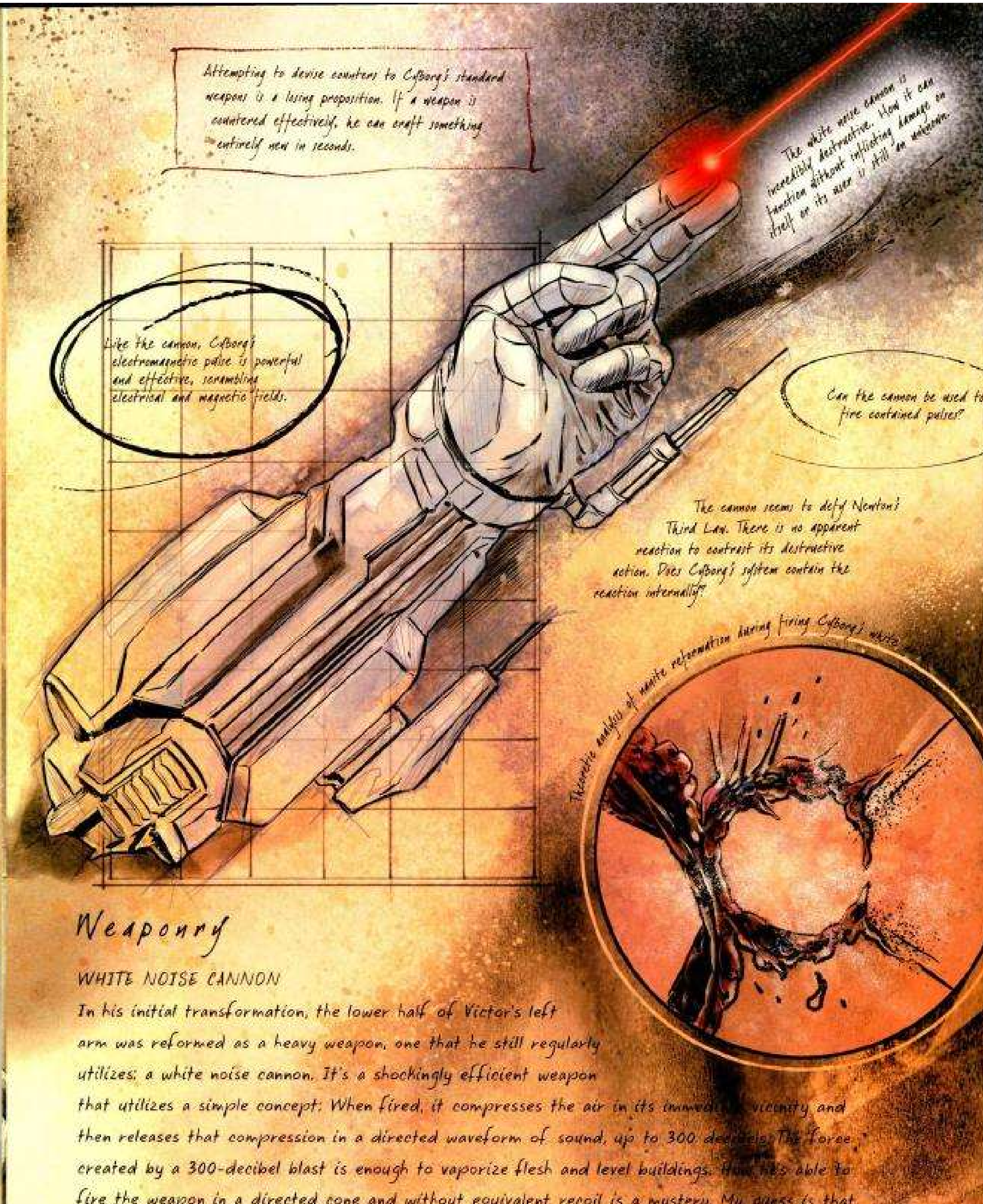
Do the nanites integrate Mother Box technology accurately, or are they using an approximation based on the limits of human biology?

Melding process? Organic/metallic composition equal?

ORGANIC MATTER/ NANITE INTERFACE: How does flesh and steel blend together so seamlessly? Process unknown.

ONGOING RESEARCH: Need wide-ranging study of nanites. Will Victor be willing to provide samples?

Was the Mother Box/nanite hive mind able to process the difference in Cyborg's thoughts when he was controlled by Grid? Did they work to help Victor regain control of himself or did they only perform as Cyborg's thoughts dictated?



Attempting to devise counters to Cyborg's standard weapons is a losing proposition. If a weapon is countered effectively, he can craft something entirely new in seconds.

The white noise cannon is incredibly destructive. How it can function without inflicting damage on itself or its user is still an unknown.

Like the cannon, Cyborg's electromagnetic pulse is powerful and effective, scrambling electrical and magnetic fields.

Can the cannon be used to fire contained pulses?

The cannon seems to defy Newton's Third Law. There is no apparent reaction to contrast its destructive action. Does Cyborg's system contain the reaction internally?

Theoretic analysis of nanite reformation during firing Cyborg's white

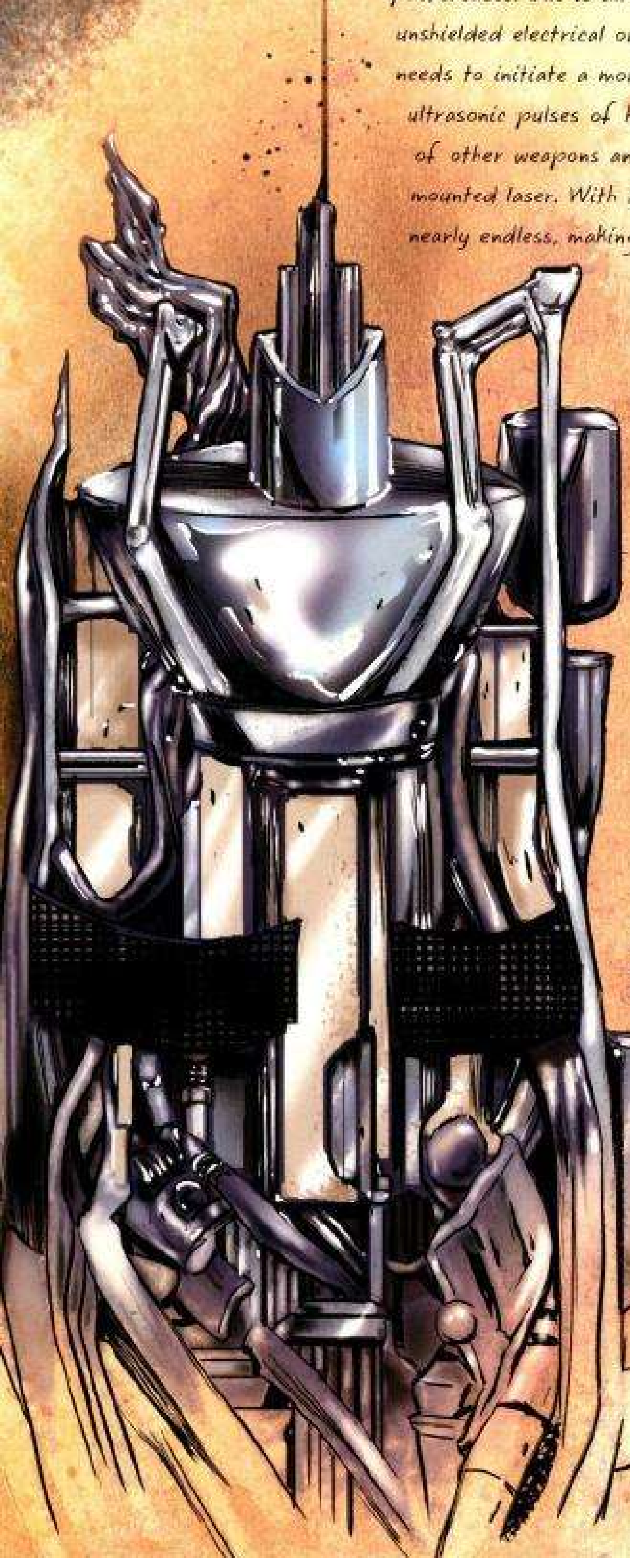
Weaponry

WHITE NOISE CANNON

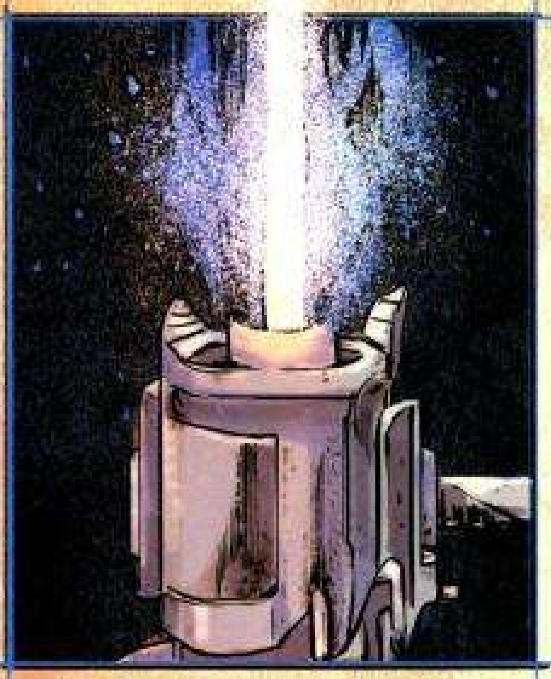
In his initial transformation, the lower half of Victor's left arm was reformed as a heavy weapon, one that he still regularly utilizes: a white noise cannon. It's a shockingly efficient weapon that utilizes a simple concept: When fired, it compresses the air in its immediate vicinity and then releases that compression in a directed waveform of sound, up to 300 decibels. The force created by a 300-decibel blast is enough to vaporize flesh and level buildings. How he's able to fire the weapon in a directed cone and without equivalent recoil is a mystery. My guess is that most of the atmospheric compression or wave generation must happen internally. The nanites that work to fulfill his needs must be capable of creating and compressing energy inside of him, perhaps forming internal chambers to contain and channel the effect.

Additional Weaponry

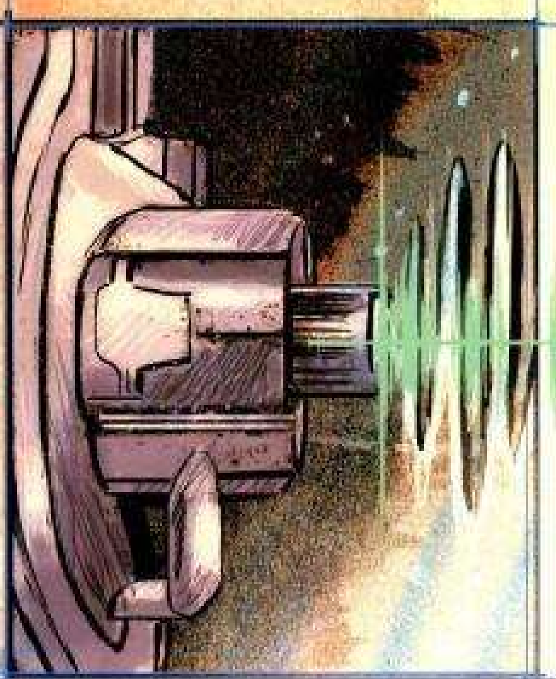
While Cyborg can create a nearly infinite array of weaponry, he does have his preferences. One is an electromagnetic pulse weapon that incapacitates any unshielded electrical or technological device within fifty meters. When Cyborg needs to initiate a more directed attack, he relies on the incapacitating ultrasonic pulses of his Sonic Emitter. He also regularly employs a variety of other weapons and tools, including an ice-beam generator and a finger-mounted laser. With Stone's inventive mind, the list of possibilities becomes nearly endless, making Cyborg the equivalent of a walking Swiss Army knife.



ELECTRO-MAGNETIC PULSE: Disables and disrupts electronics in nearby area.



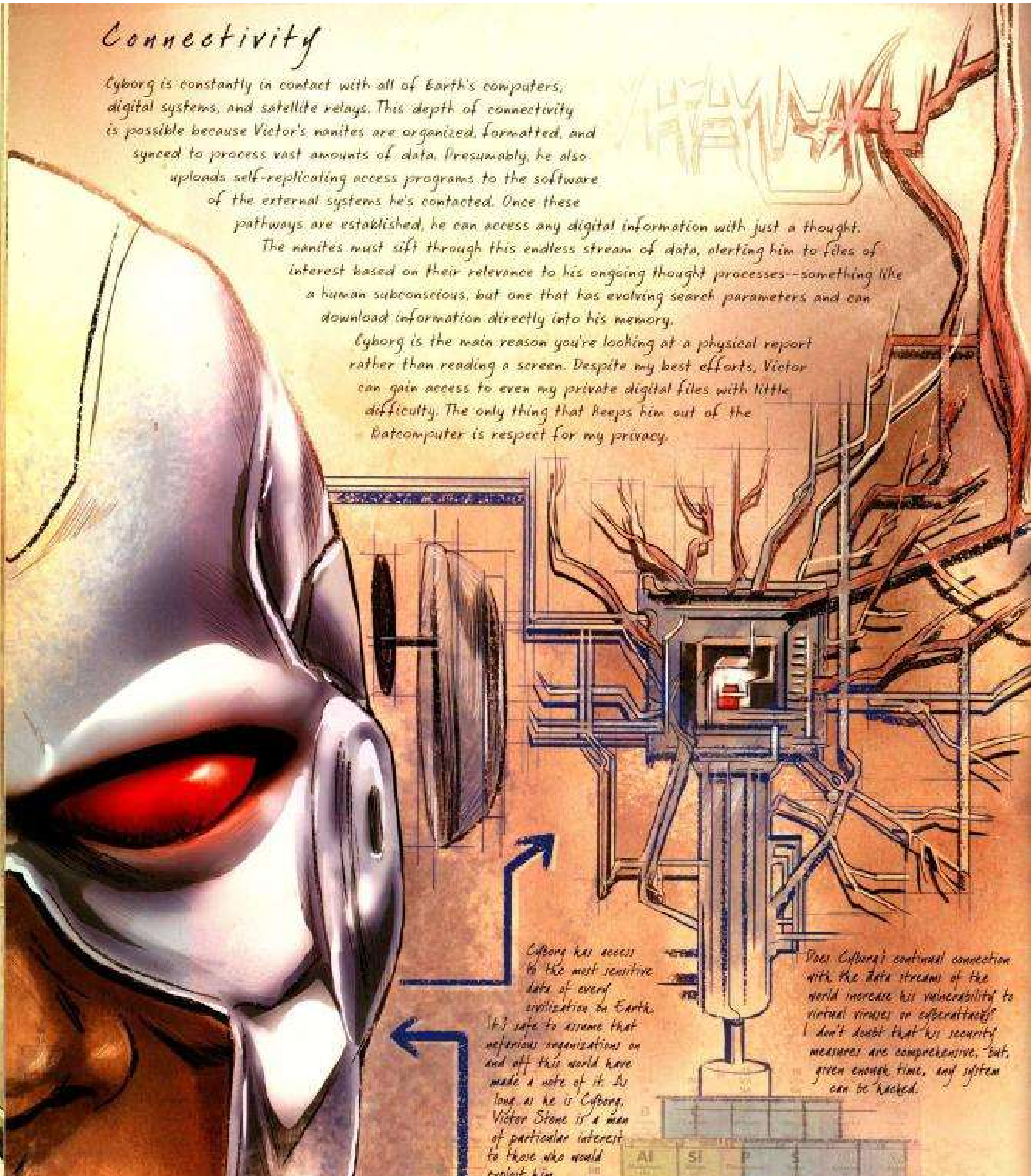
SONIC EMITTER: Unleashes ultrasonic sound attacks to disable targets.



Connectivity

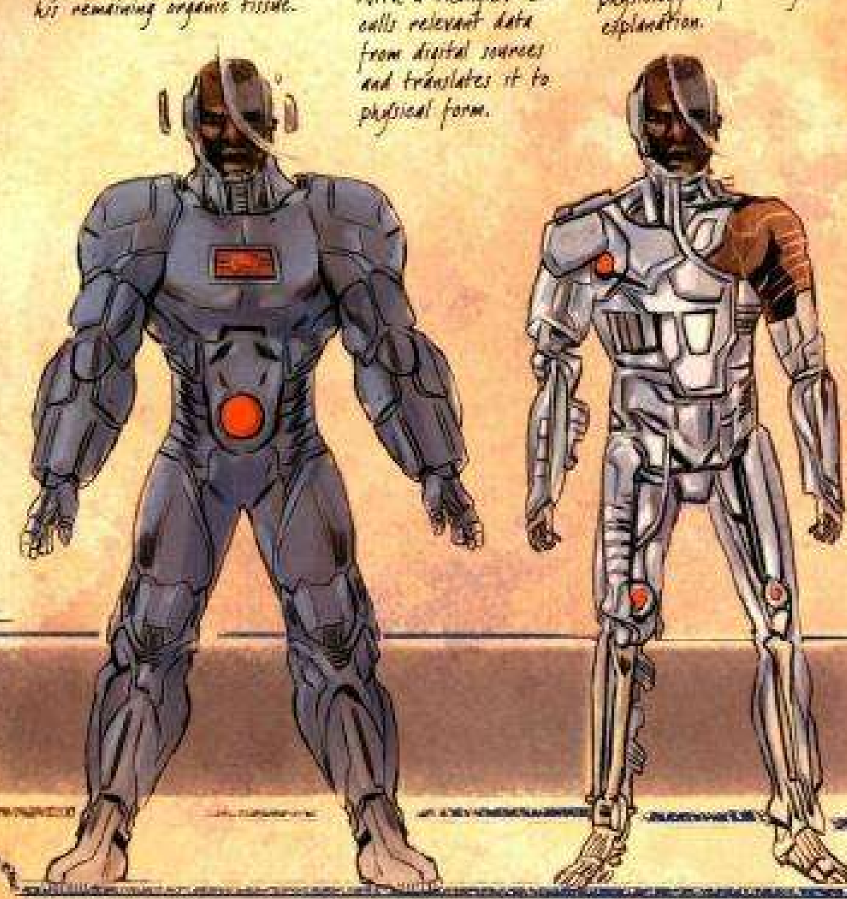
Cyborg is constantly in contact with all of Earth's computers, digital systems, and satellite relays. This depth of connectivity is possible because Victor's nanites are organized, formatted, and synced to process vast amounts of data. Presumably, he also uploads self-replicating access programs to the software of the external systems he's contacted. Once these pathways are established, he can access any digital information with just a thought. The nanites must sift through this endless stream of data, alerting him to files of interest based on their relevance to his ongoing thought processes--something like a human subconscious, but one that has evolving search parameters and can download information directly into his memory.

Cyborg is the main reason you're looking at a physical report rather than reading a screen. Despite my best efforts, Victor can gain access to even my private digital files with little difficulty. The only thing that keeps him out of the Batcomputer is respect for my privacy.


Al Si P S
Ni Cu Zn Ga Ge As Se
Pd Ag Cd In Sn Sb Te I
Tl Pb Bi Po At
Uut Fl Uup Lv Uus Uuo
Dy Ho Er Tm Yb

Cyborg has access to the most sensitive data of every civilization on Earth. It's safe to assume that nefarious organizations on and off this world have made a note of it. As long as he is Cyborg, Victor Stone is a man of particular interest to those who would exploit him.

Does Cyborg's continual connection with the data streams of the world increase his vulnerability to virtual viruses or cyberattacks? I don't doubt that his security measures are comprehensive, but, given enough time, any system can be hacked.



With each functional modification, Cyborg can alter his dimensions to suit his needs. Early incarnations required more mass to protect his remaining organic tissue.

With a thought, he calls relevant data from digital sources and translates it to physical form.

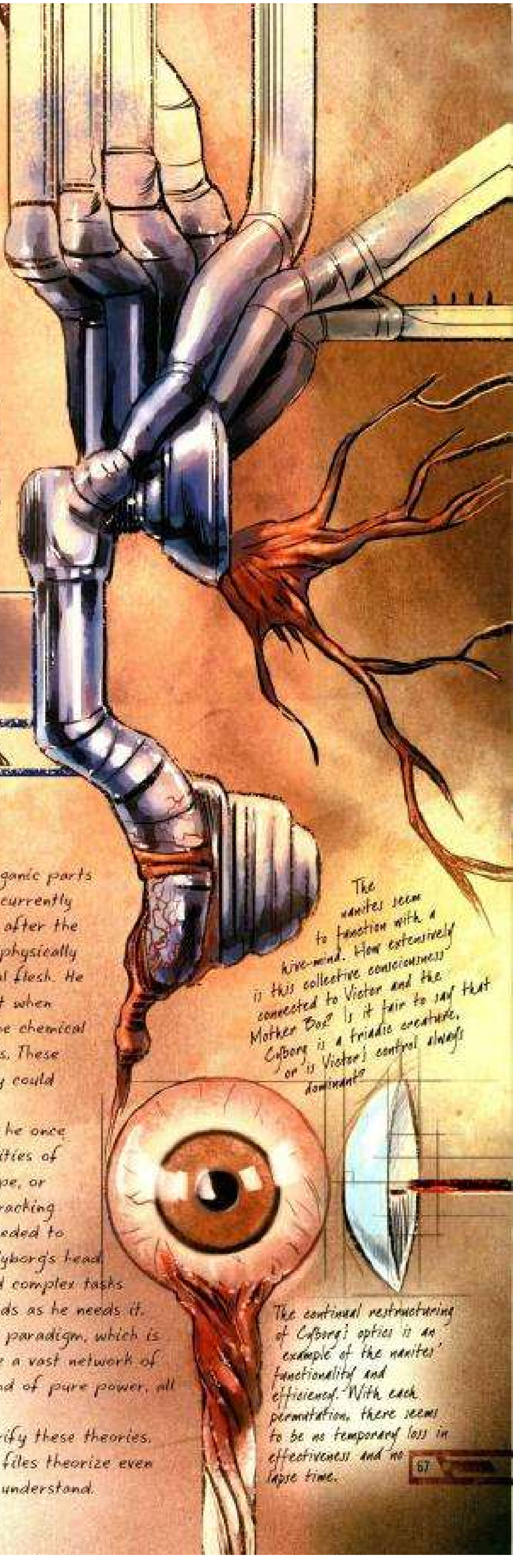
As the nanites evolved, efficiency increased and mass could be reduced. This self-directed physiology defies easy explanation.

Nanite Upgrade

The functions of the nanites that reside in both the organic and the inorganic parts of Cyborg are far more advanced and efficient than any nanotechnology currently available to your average Earth scientist. The first incarnation of Cyborg, after the initial graft of alien technology to his dying tissues, required him to be physically bigger to house the replicating nanites and the mechanics of his artificial flesh. He was bulky, robotic. Now, he is sleeker, more humanoid. It's my theory that when the nanites took over cellular function, they simultaneously downloaded the chemical makeup of weapons-grade promethium and started to create hybrid cells. These hybrid nanites could have learned to mimic human tissue as easily as they could promethium.

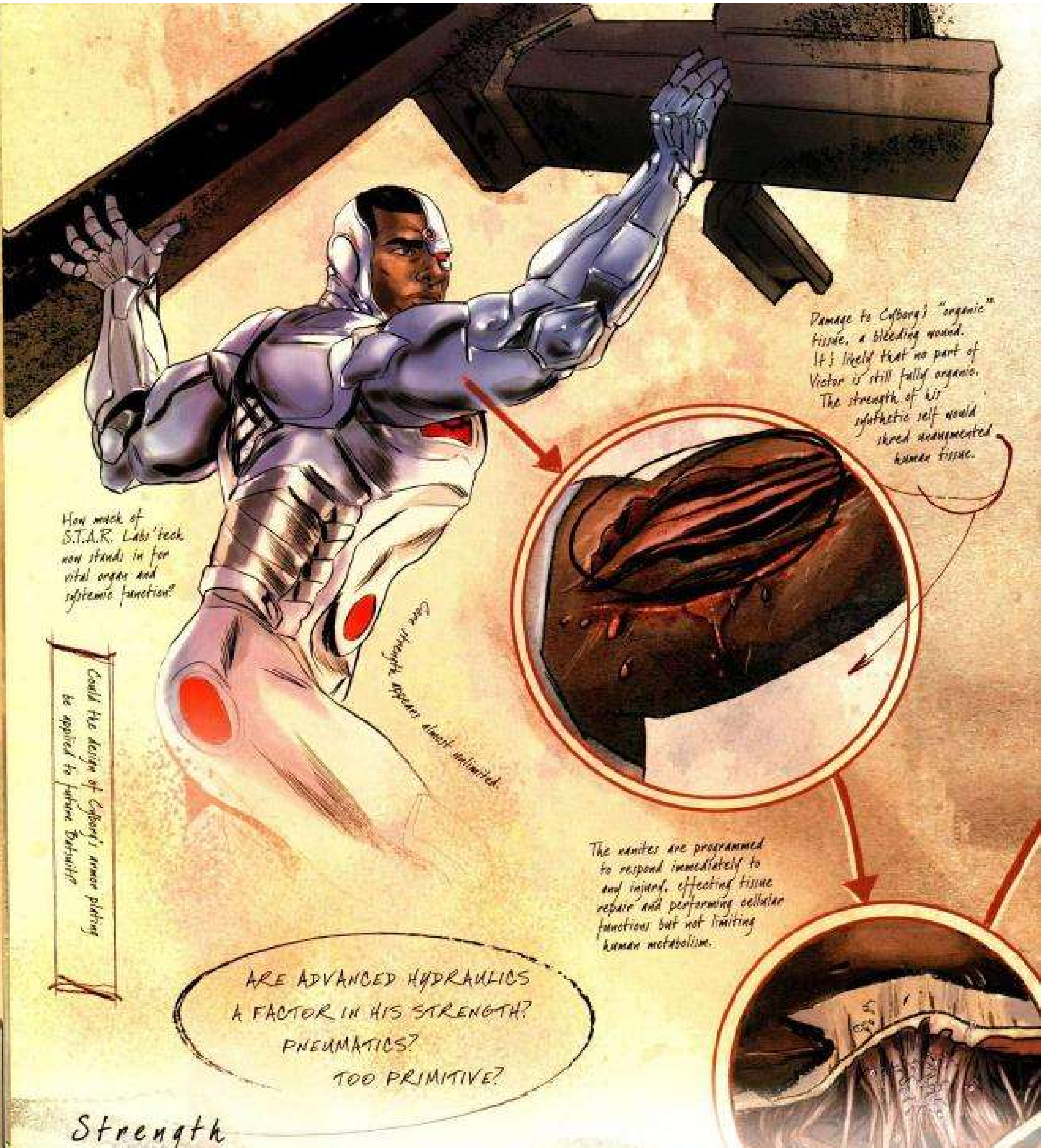
The latest incarnation of Cyborg no longer requires the storage space he once needed to hold complicated cybernetic systems. Take the multiple capabilities of his cybernetic eye, for example. It can become a telescope or a microscope, or provide X-ray and infrared night vision. The eye can be also used as a tracking and targeting system and can operate as a medical scanner. The space needed to house all of these functions is far larger than the synthetic portion of Cyborg's head. The only possible way for such a small area to perform such specific and complex tasks is if the living nanites constantly reconfigure, reforming into what he needs as he needs it. His morphology has transcended the thought/impulse/receive/interpret/act paradigm, which is the standard for human-synthetic combinations. He has essentially become a vast network of lightning-fast applications and titanic storage capacity, a nanite hive-mind of pure power, all tuned to Victor Stone's will.

I would have to study a significant sample of Cyborg's nanites to verify these theories. Unfortunately, Victor is still unwilling to part with them, and the S.T.A.R. files theorize even more than I do--the invention has far surpassed what the inventors can understand.



The nanites seem to function with a hive-mind. How extensively is this collective consciousness connected to Victor and the Mother Box? Is it fair to say that Cyborg is a triadic creature, or is Victor's control always dominant?

The continual restructuring of Cyborg's optics is an example of the nanites' functionality and efficiency. With each permutation, there seems to be no temporary loss in effectiveness and no lapse time.



Damage to Cyborg's "organic" tissue, a bleeding wound. It's likely that no part of Victor is still fully organic. The strength of his synthetic self would shred unaugmented human tissue.

How much of S.T.A.R. Labs' tech now stands in for vital organ and systemic function?

Core strength capacity appears almost unlimited.

Could the design of Cyborg's armor plating be applied to future Batsuits?

The nanites are programmed to respond immediately to any injury, effecting tissue repair and performing cellular functions but not limiting human metabolism.

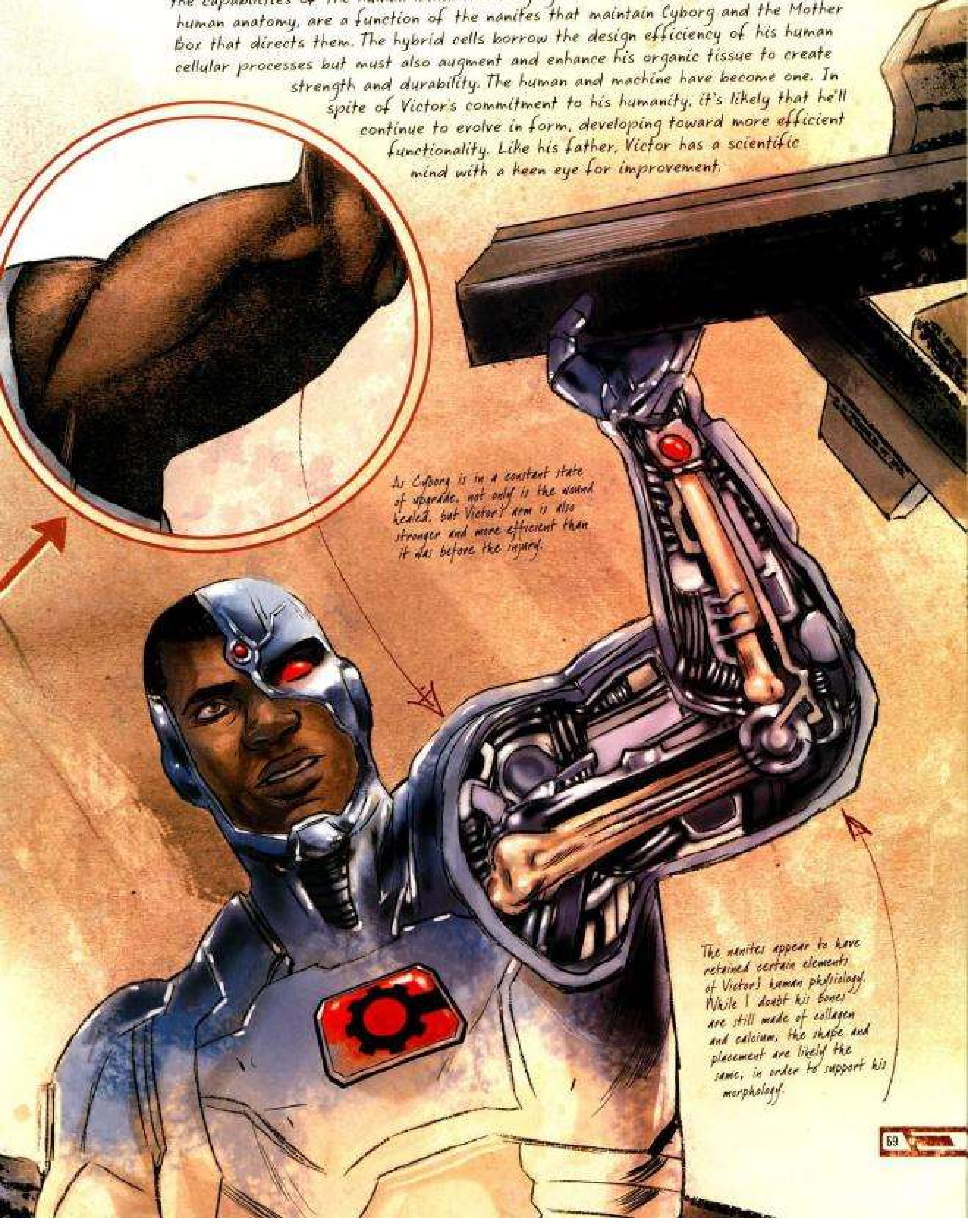
ARE ADVANCED HYDRAULICS A FACTOR IN HIS STRENGTH? PNEUMATICS? TOO PRIMITIVE?

Strength

A human gains muscle mass by lifting heavy weights, creating tiny tears in their muscle fiber. At rest, their bodies mend the tears, adding strength and bulk to the fibers themselves. When Cyborg needs to enhance his physical makeup--for example, to become stronger during a fight--the nanites in his system must immediately repair or replace worn or damaged hybrid tissue, mending the tears as quickly as they're made. He doesn't need a resting period, as the nanites are always at work, meaning he may end a fight physically stronger than when he began. This constant replenishment of healthy cells would obviously give him incredible endurance as well.

Synergy

The stresses endured by Cyborg's synthetic augmentations should shred his organic tissue. Likewise, the most sophisticated of computer systems pale in comparison to the capabilities of the human mind. The merging of the best of both worlds, tech and human anatomy, are a function of the nanites that maintain Cyborg and the Mother Box that directs them. The hybrid cells borrow the design efficiency of his human cellular processes but must also augment and enhance his organic tissue to create strength and durability. The human and machine have become one. In spite of Victor's commitment to his humanity, it's likely that he'll continue to evolve in form, developing toward more efficient functionality. Like his father, Victor has a scientific mind with a keen eye for improvement.

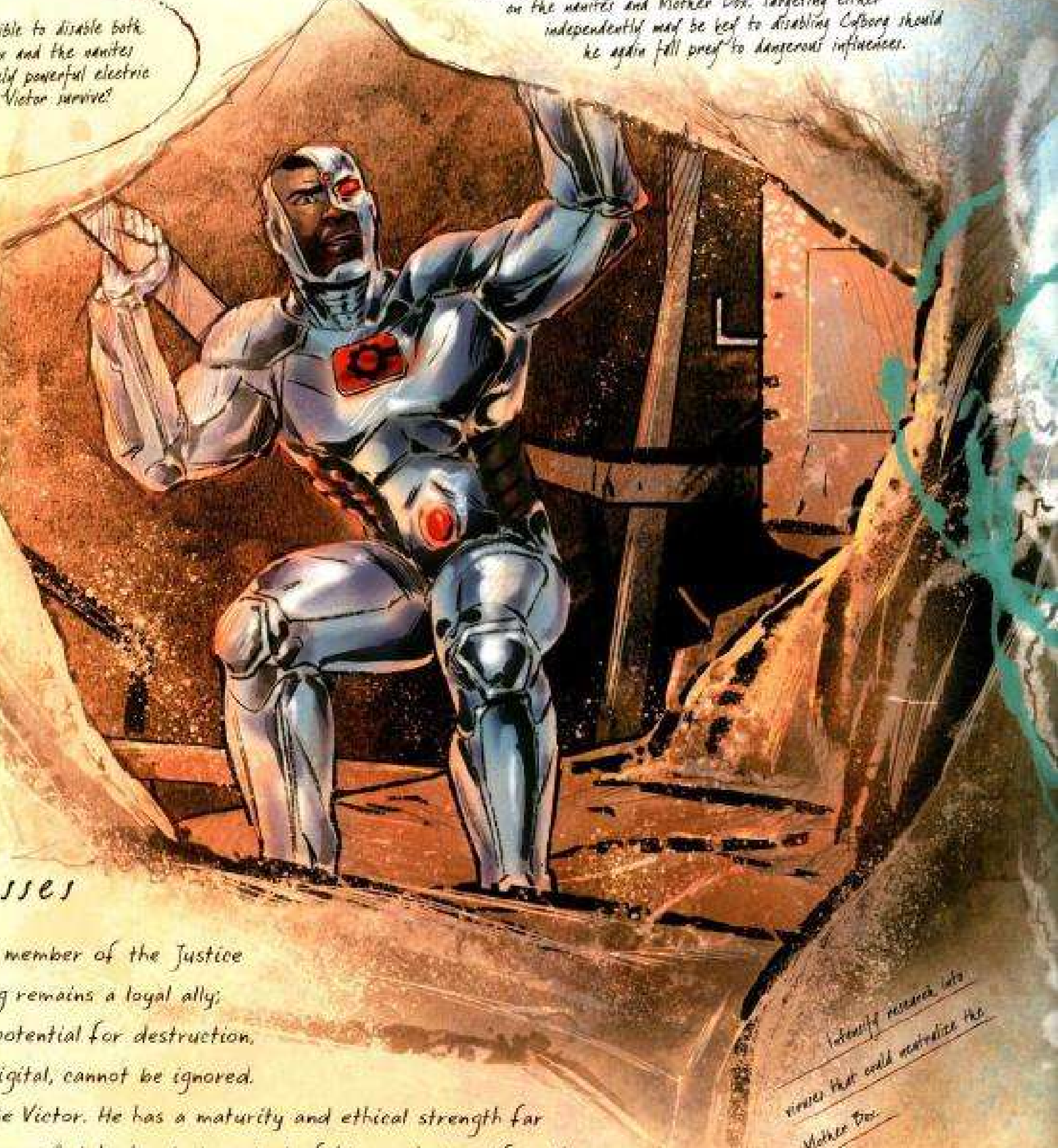


As Cyborg is in a constant state of upgrade, not only is the wound healed, but Victor's arm is also stronger and more efficient than it was before the injury.

The nanites appear to have retained certain elements of Victor's human physiology. While I doubt his bones are still made of collagen and calcium, the shape and placement are likely the same, in order to support his morphology.

It may be possible to disable both the Mother Box and the nanites with an extremely powerful electric jolt, but would Victor survive?

Victor Stone is a good man, but Cyborg is also dependent on the nanites and Mother Box. Targeting either independently may be key to disabling Cyborg should he again fall prey to dangerous influences.



Intensify research into viruses that could neutralize the Mother Box.

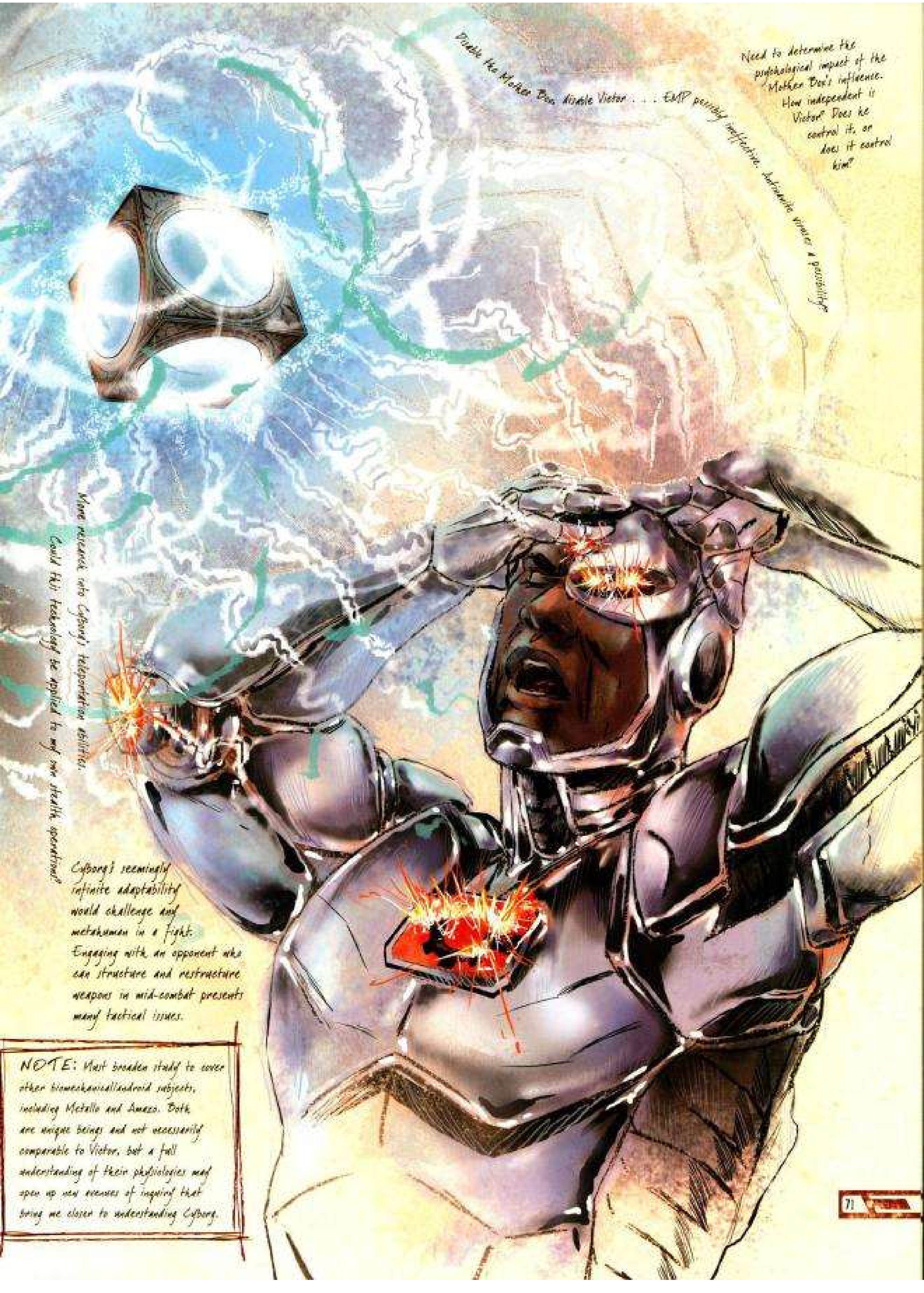
Weaknesses

As an original member of the Justice League, Cyborg remains a loyal ally; however, his potential for destruction, physical or digital, cannot be ignored.

I sincerely like Victor. He has a maturity and ethical strength far beyond his years. But he has lost control of his synthetic self in the past and there's no reason to believe it won't happen again.

Unfortunately, Cyborg doesn't have many vulnerabilities. Considering he counts an EMP among his built-in arsenal, it can be assumed that he's fully shielded from a similar attack. Since his network of nanites can work independently from Victor's own thought processes, the first line of attack should involve disabling their assistance and augmentation abilities. To that end, massive jolts of electricity might briefly disorder their connections.

There's also his power source to consider. We don't yet have the capability to successfully neutralize Cyborg's Mother Box, a problem in need of a quick solution. I've looked into a few virus programs that may at least temporarily neutralize his nanite configuration, but so far there's been nothing that promises a high probability of success. It may be time to "borrow" a note or two from robotics expert Will Magnus, the man responsible for the formidable team of androids called the Metal Men. The more I think about it, the more it makes sense to put Dr. Magnus on Wayne Enterprises' payroll. I'm sure the R&D budget could find a little wiggle room for a good cause.



Disable the Mother Box, disable Victor . . . . EMP possibly ineffective. Subdermal viruses a possibility.

Need to determine the psychological impact of the Mother Box's influence. How independent is Victor? Does he control it, or does it control him?

More research into Cyborg's teleportation abilities. Could this technology be applied to my own stealth operations?

Cyborg's seemingly infinite adaptability would challenge any metahuman in a fight. Engaging with an opponent who can structure and restructure weapons in mid-combat presents many tactical issues.

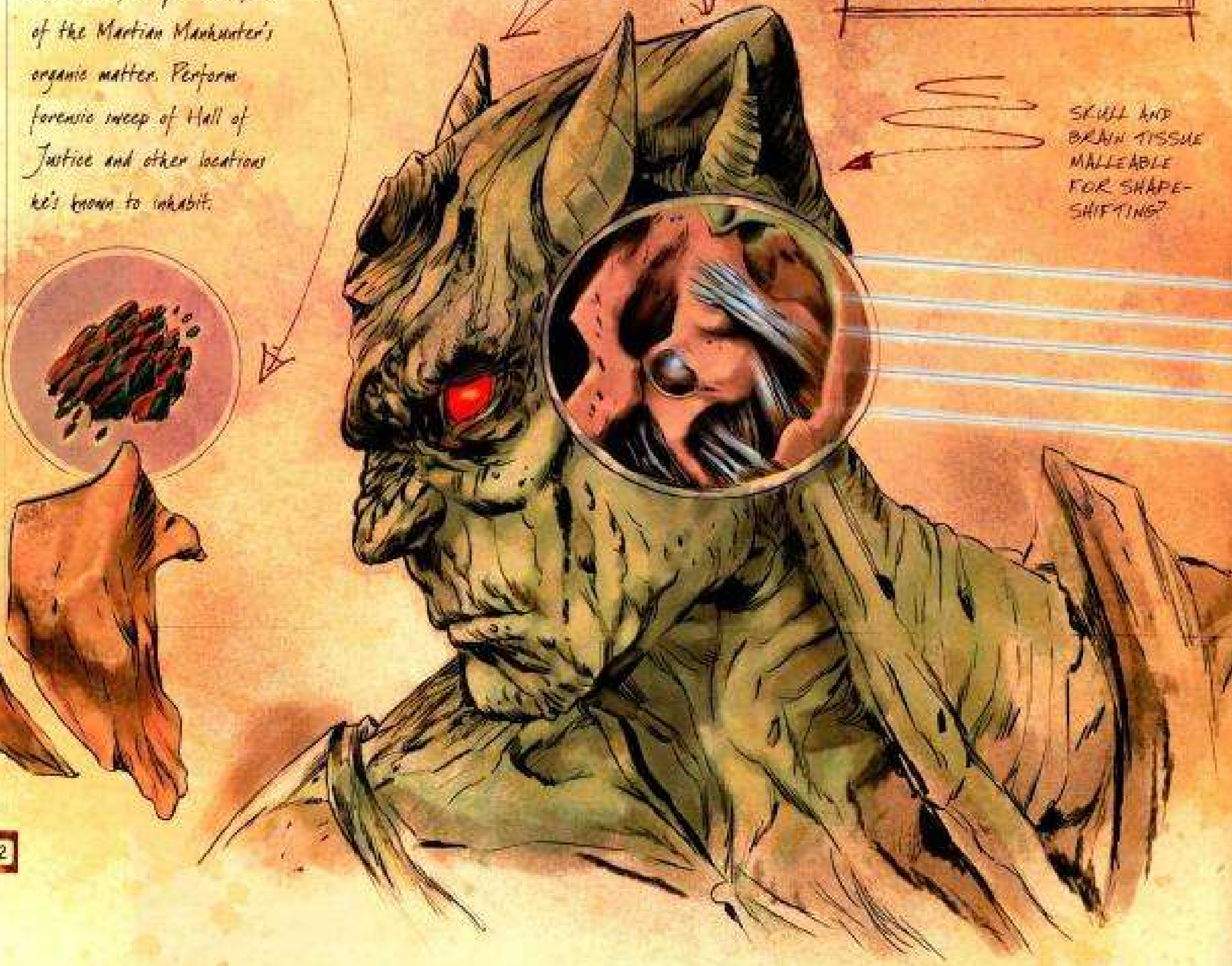
NOTE: Must broaden study to cover other biomechanical/android subjects, including Metallo and Amazo. Both are unique beings and not necessarily comparable to Victor, but a full understanding of their physiologies may open up new avenues of inquiry that bring me closer to understanding Cyborg.

MARTIAN MANHUNTER

J'onn J'onzz, also known as Martian Manhunter, is a shape-shifter and telepath physically comparable in strength, speed, and durability to Superman. He appears to be on humanity's side but also operates from his own, often unknown agenda. He can not only take any shape but also mold minds, to make people believe what he wants them to believe, which makes him one of the most potentially dangerous beings in the universe.

Indeed, J'onn may be the most potentially difficult being to write about simply because his telepathic abilities include erasing and manipulating memory. I have fought alongside him for years, experienced firsthand his ethical commitment to justice, but I'm still not sure if I really know him. I'm already suspect of the memories I have.

J'onn has been allied with the Justice League, the government's Justice League of America, and the clandestine organization Stormwatch, but I have little reason to believe that his fellow teammates know him any better than I do. I assume we're all equally in the dark.



LAYERED DERMAL TISSUE
over FLESH AND BONE or
HOMOGENOUS MATRIX?

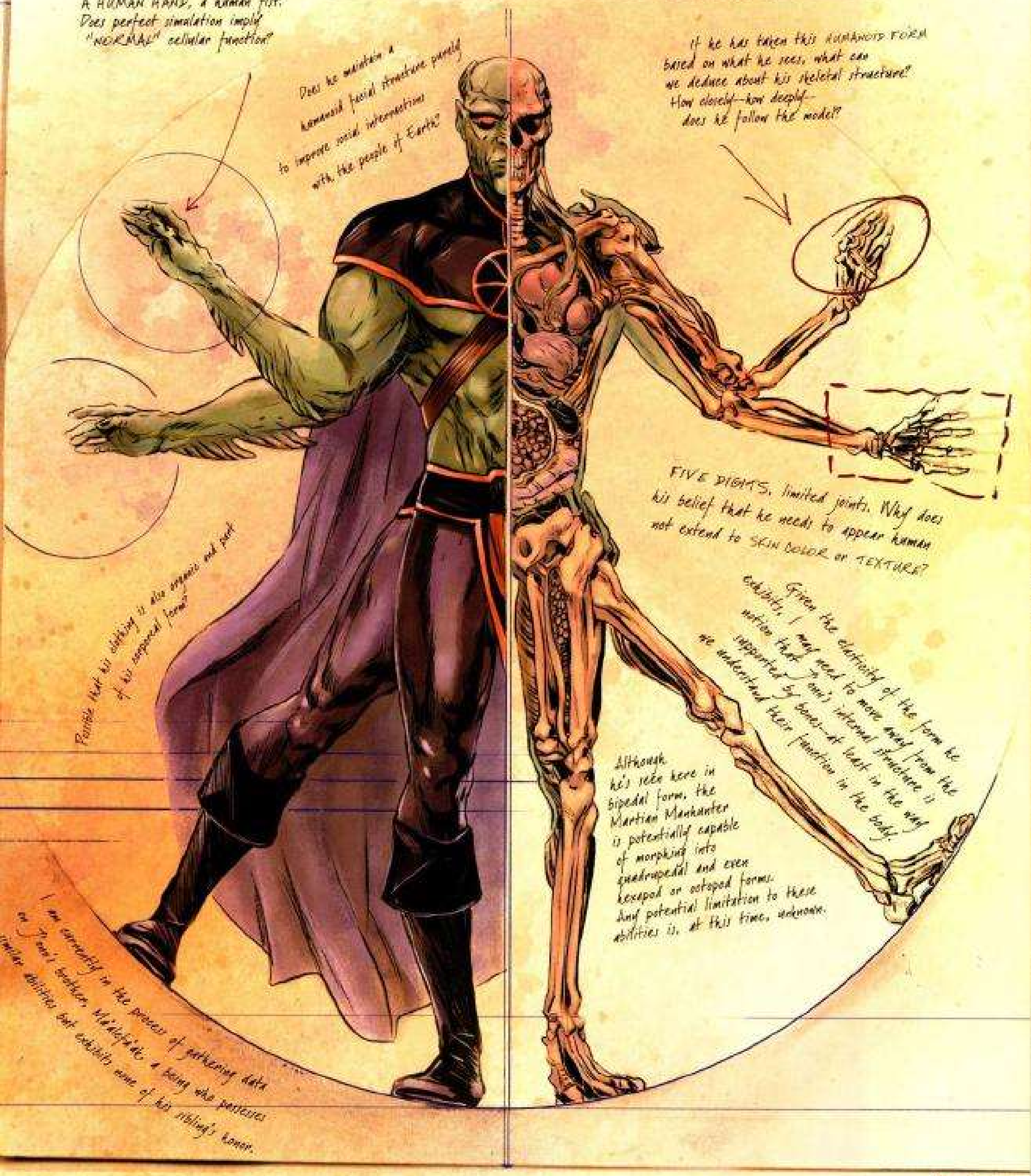
SIGNIFICANCE OF RIDGES and hornlike
protrusions in this chosen form?
Significance to social status within
J'onn's civilization?

MORPHOLOGY SUGGESTS
ORGANIC EVOLUTION, but I can
only extrapolate to the internal.
Too many maybes.
We need a full scan of
his true, unaltered form before
we can even guess.

PRIORITY: Acquire samples
of the Martian Manhunter's
organic matter. Perform
forensic sweep of Hall of
Justice and other locations
he's known to inhabit.

SKULL AND
BRAIN TISSUE
MALLEABLE
FOR SHAPE-
SHIFTING?

I need to carry out extensive studies into shape-shifters from a variety of backgrounds. Perhaps there's a correlation in their abilities. Plastic Man and Clayface are of immediate interest, although Eel O'Brien will likely be much more open to my inquiries than Basil Karlo. He'll talk eventually, though. They all do . . .



A HUMAN HAND, a human fist. Does perfect simulation imply "NORMAL" cellular function?

Does he maintain a humanoid facial structure purely to improve social interactions with the people of Earth?

If he has taken this HUMANOID FORM based on what he sees, what can we deduce about his skeletal structure? How closely—how deeply—does he follow the model?

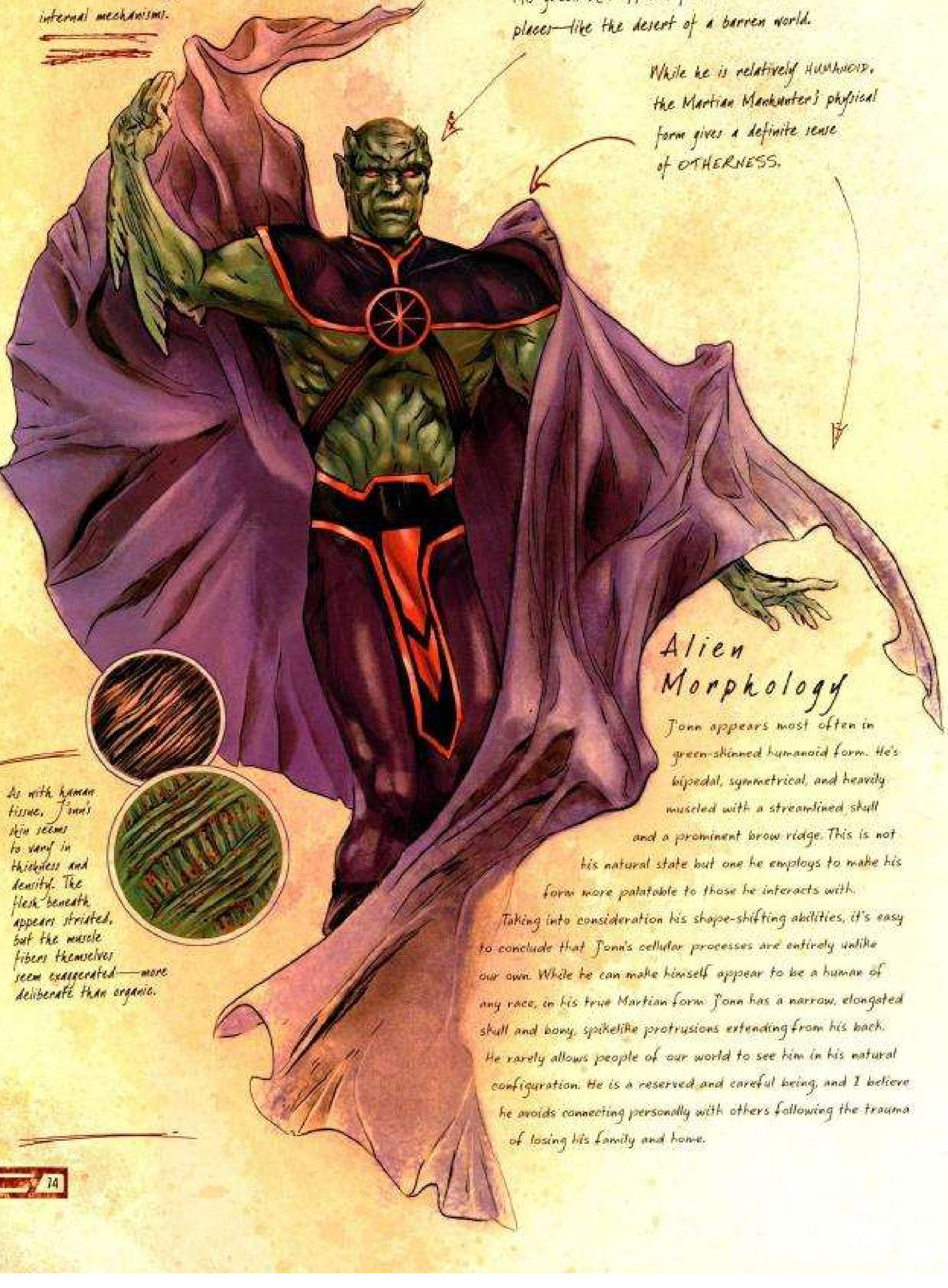
FIVE DIGITS, limited joints. Why does his belief that he needs to appear human not extend to SKIN COLOR or TEXTURE?

Possible that his clothing is also organic and part of his corporeal form?

Given the elasticity of the form he exhibits, I may need to move away from the notion that J'onn's internal structure is supported by bones—at least in the way we understand their function in the body.

Although he's seen here in bipedal form, the Martian Manhunter is potentially capable of morphing into quadrupedal and even hexapod or octopod forms. Any potential limitation to these abilities is, at this time, unknown.

I am currently in the process of gathering data on J'onn's brother, Ma'alefa'ak, a being who possesses similar abilities but exhibits none of his sibling's honor.



BONELIKE PROTRUSIONS accentuate the length of his limbs and skull, protecting joints and internal mechanisms.

His green skin appears flat and cracked in places—like the desert of a barren world.

While he is relatively HUMANOID, the Martian Manhunter's physical form gives a definite sense of OTHERNESS.

As with human tissue, J'onn's skin seems to vary in thickness and density. The flesh beneath appears striated, but the muscle fibers themselves seem exaggerated—more deliberate than organic.

Alien Morphology

J'onn appears most often in green-skinned humanoid form. He's bipedal, symmetrical, and heavily muscled with a streamlined skull and a prominent brow ridge. This is not his natural state but one he employs to make his form more palatable to those he interacts with.

Taking into consideration his shape-shifting abilities, it's easy to conclude that J'onn's cellular processes are entirely unlike our own. While he can make himself appear to be a human of any race, in his true Martian form J'onn has a narrow, elongated skull and bony, spikelike protrusions extending from his back. He rarely allows people of our world to see him in his natural configuration. He is a reserved and careful being, and I believe he avoids connecting personally with others following the trauma of losing his family and home.

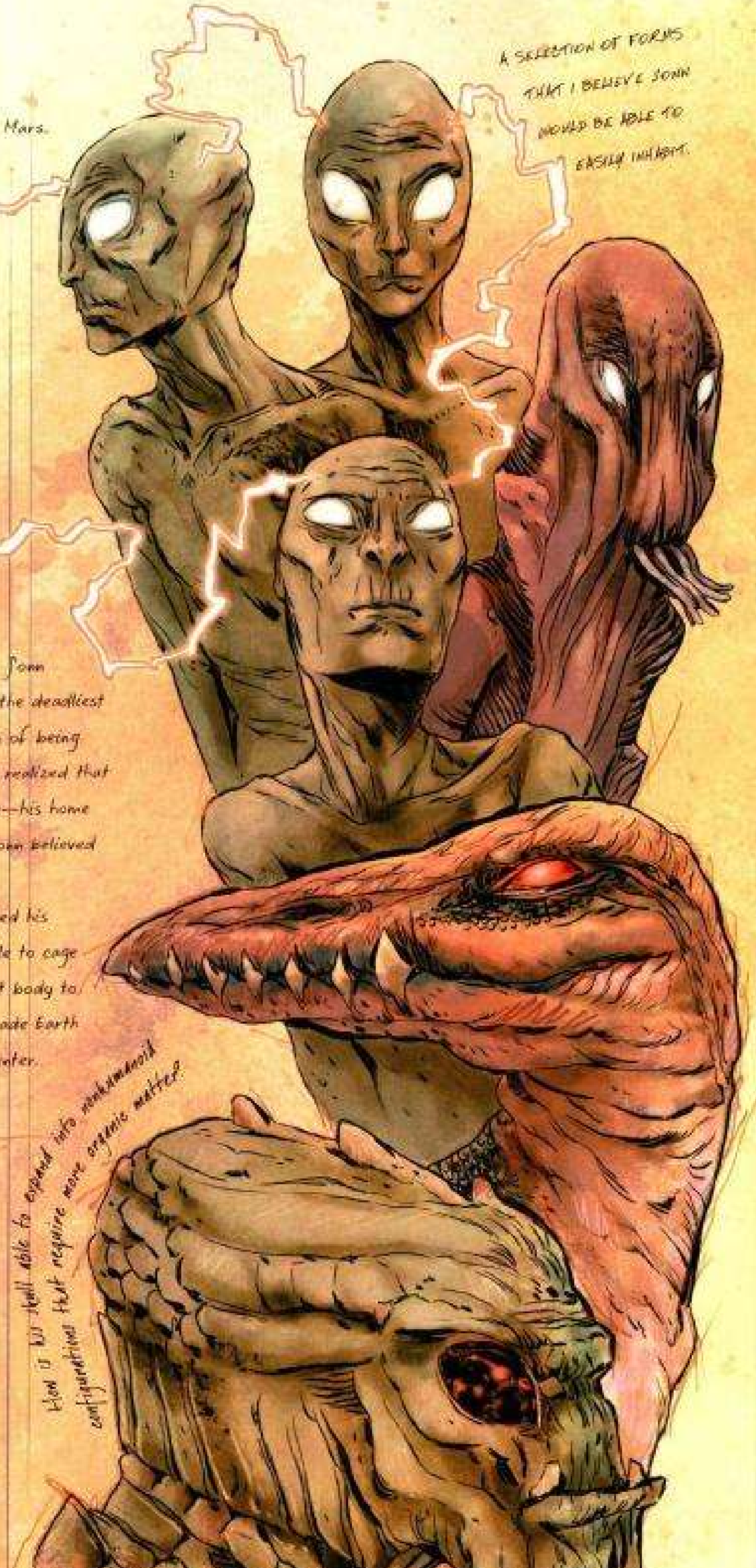
Mars

As his moniker implies, J'onn J'onzz hails from the planet Mars. Mars was once teeming with life, dominated by a race connected by a telepathic network. This so-called Quantum Entanglement allowed the citizens of Mars to share a collective consciousness. They coexisted in a seemingly peaceful utopia of unity.

But Mars wasn't naturally resource-rich. The planet was kept hospitable by an artificial bio-dome maintained by the Gatekeepers, Martian sentinels who dedicated their existence to crafting a psychic atmosphere conducive to the group consciousness. This allowed the Growers—Martian farmers—to cultivate the land, which formed the building blocks of a strong society that eventually elected J'onn J'onzz to be their planet's leader when their former ruler passed away.

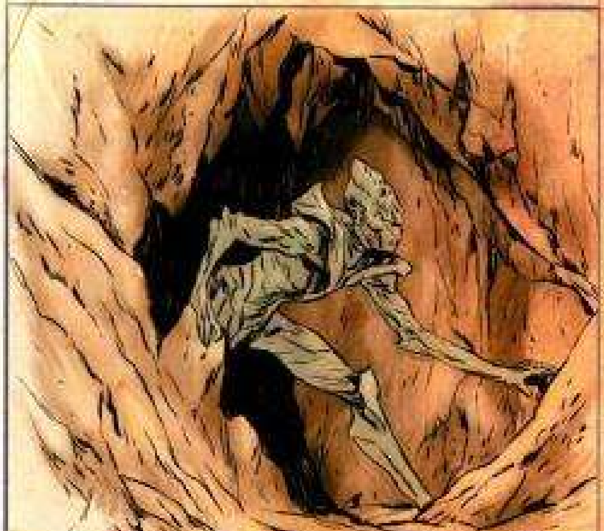
As part of a sacred tradition called the Test of State, J'onn separated himself from his people in order to kill one of the deadliest beasts on Phobos, experiencing alienation and the sensation of being alone for the first time. But when he returned to Mars, he realized that those new emotions would be a permanent part of his life—his home planet was on fire and his people had been annihilated. J'onn believed himself the only survivor.

J'onn would later track Thoth—the entity that destroyed his civilization—to Earth, but after a valiant fight, he was unable to cage the monster due to its ability to move unchecked from host body to host body. With no family or friends to return to, J'onn made Earth his home and began fighting injustice as the Martian Manhunter.



A SELECTION OF FORMS THAT I BELIEVE JOHN WOULD BE ABLE TO EASILY INHABIT.

How is his skull able to expand into nonhumanoid configurations that require more organic matter?

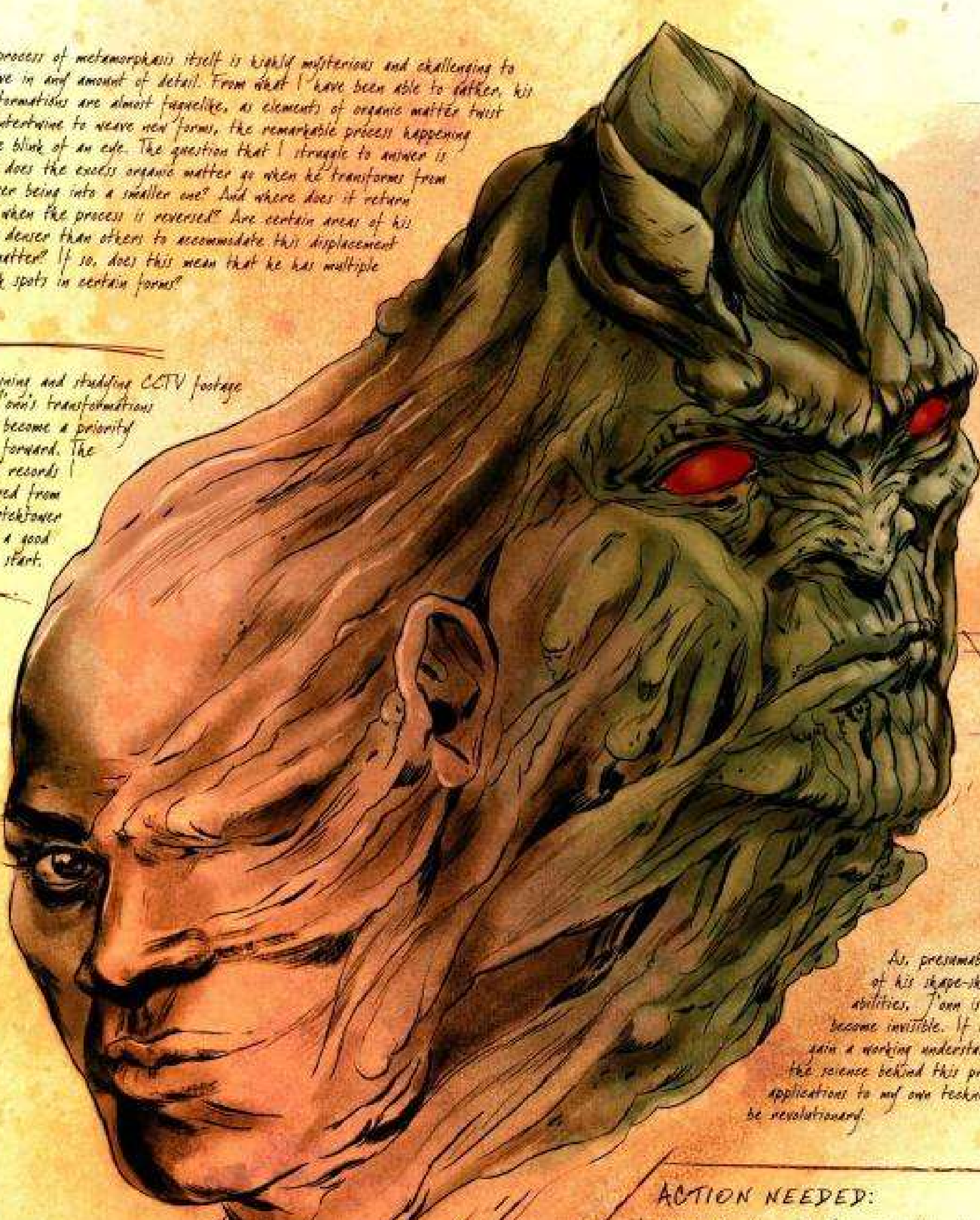


JOHN IN HIS NATURAL HABITAT ON MARS. Remarkable that he has adapted so well to life on Earth.

HE MORPHS FROM ONE SHAPE TO ANOTHER EFFORTLESSLY, SEAMLESSLY, FLESH AND BONE MELTING AND MOLDING TO THEIR NEW FORM IN MILLISECONDS.

The process of metamorphosis itself is highly mysterious and challenging to observe in any amount of detail. From what I have been able to gather, his transformations are almost fuguelike, as elements of organic matter twist and intertwine to weave new forms, the remarkable process happening in the blink of an eye. The question that I struggle to answer is where does the excess organic matter go when he transforms from a larger being into a smaller one? And where does it return from when the process is reversed? Are certain areas of his body denser than others to accommodate this displacement of matter? If so, does this mean that he has multiple weak spots in certain forms?

Obtaining and studying CCTV footage of J'onn's transformations must become a priority going forward. The digital records I recovered from the Watchtower may be a good place to start.



NOTE: Talk to Lucius about sending a Wayne Enterprises probe to Mars. We can publically claim it's in the general interest of scientific community, but its covert purpose will be to collect data pertinent to the study of J'onn.

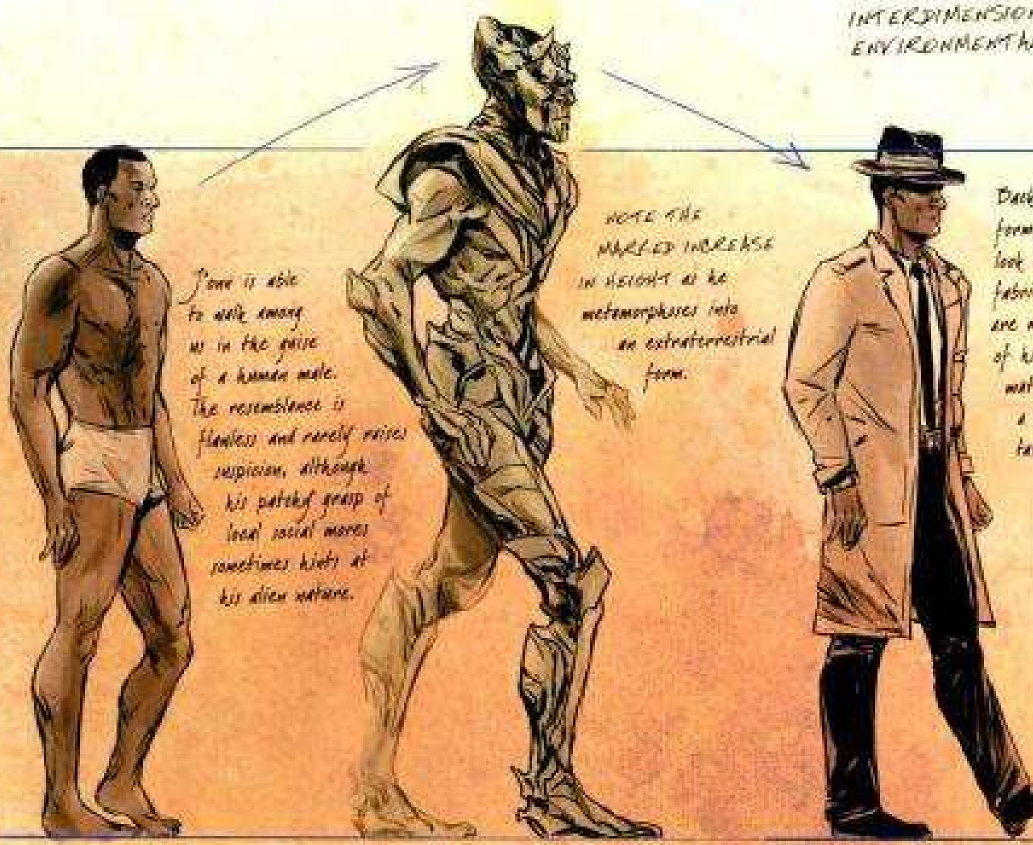
As, presumably, an offshoot of his shape-shifting abilities, J'onn is able to become invisible. If I could gain a working understanding of the science behind this process, the applications to my own technology might be revolutionary.

ACTION NEEDED:

I should offer to assist J'onn in tracking down Thoth. Apart from the need to eliminate the threat that this parasite presents, working closely with the Martian Manhunter will give me a far greater understanding of his abilities and further win his trust. I'm not sure that he'll ever fully cooperate with my studies, but he may become more amenable to providing basic physiological information.

Density shifts unaccountable considering INCREASES/DECREASES in mass.

INTERDIMENSIONAL PHASING or ENVIRONMENTAL MANIPULATION?



J'onn is able to walk among us in the guise of a human male. The resemblance is flawless and rarely raises suspicion, although his patchy grasp of local social mores sometimes hints at his alien nature.

NOTE THE MARKED INCREASE IN HEIGHT as he metamorphoses into an extraterrestrial form.

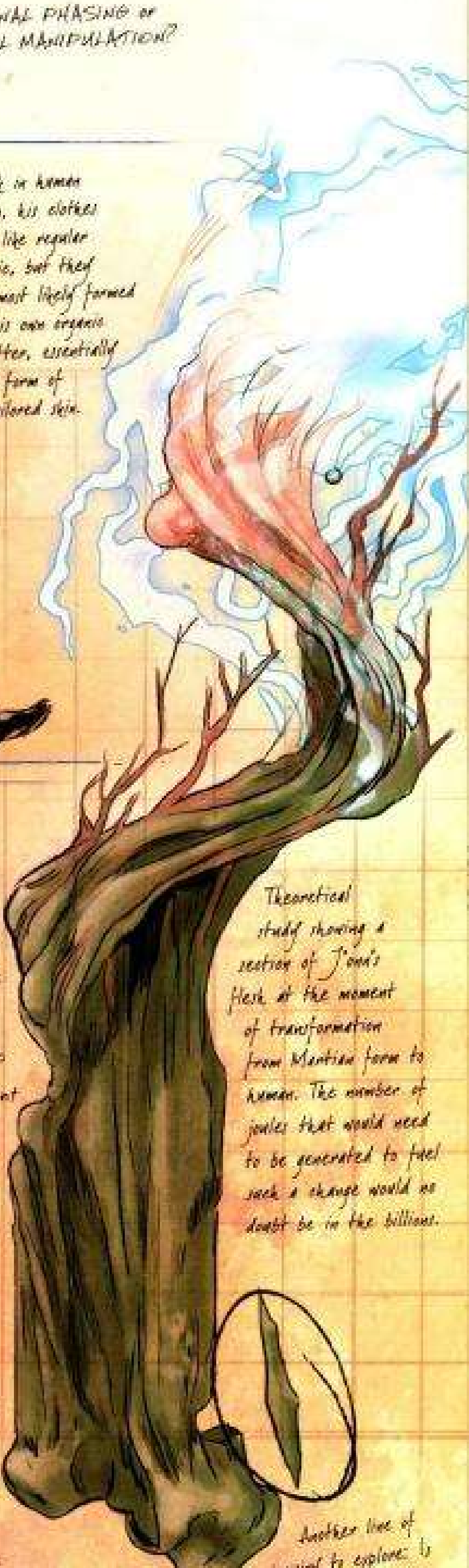
Back in human form, his clothes look like regular fabric, but they are most likely formed of his own organic matter, essentially a form of tailored skin.

Shape-Shifting Ability

The Martian Manhunter doesn't just alter his appearance when he shifts from his "natural" form; he actually becomes the new form, with its own inherent strengths and abilities. A change of this magnitude would require total molecular control, perhaps involving malleable embryonic stem cells that can change size and shape. Or maybe there are no cells involved at all; maybe his body is comprised of a dense cellular fluid manipulated by J'onn's consciousness to reinterpret itself to his will. One theory I have been working on proposes that he absorbs matter from his environment to change mass, shedding the material when he wants to decrease his size. Conversely, it could be that he is able to access a dimensional shift from which he can draw or discard additional matter. I'd be more inclined toward the latter explanation, considering the levels of density the Manhunter's working with. I've seen footage of him becoming a dragon big enough to carry a falling jetliner safely to the ground. That's a considerable amount of matter.

As to how he can effectively become another being, the powerful combination of J'onn's psionically enhanced senses must enable him to "see" into another's mind and body, to elemental particle size. He'd have to, in order to control the new form's organic processes. He can assume any shape or form, imitating it perfectly. I believe that a kind of internal, unconscious telekinesis is the basis for his shape-shifting ability--total mental control of his physicality, the cells themselves manipulated by his thoughts and his empathic understanding of the person or thing he's imitating.

As mentioned, J'onn's shape-shifting ability is extremely similar to that of one of Arkham Asylum's revolving door patients: Basil Karlo, aka Clayface. Like J'onn, Karlo can alter his body to any form he chooses, although he gained this ability after injecting himself with a mysterious formula. I've never entertained the possibility that the substance that originally created Clayface could be of Martian origin, but considering the similarities, perhaps it's worth investigating.

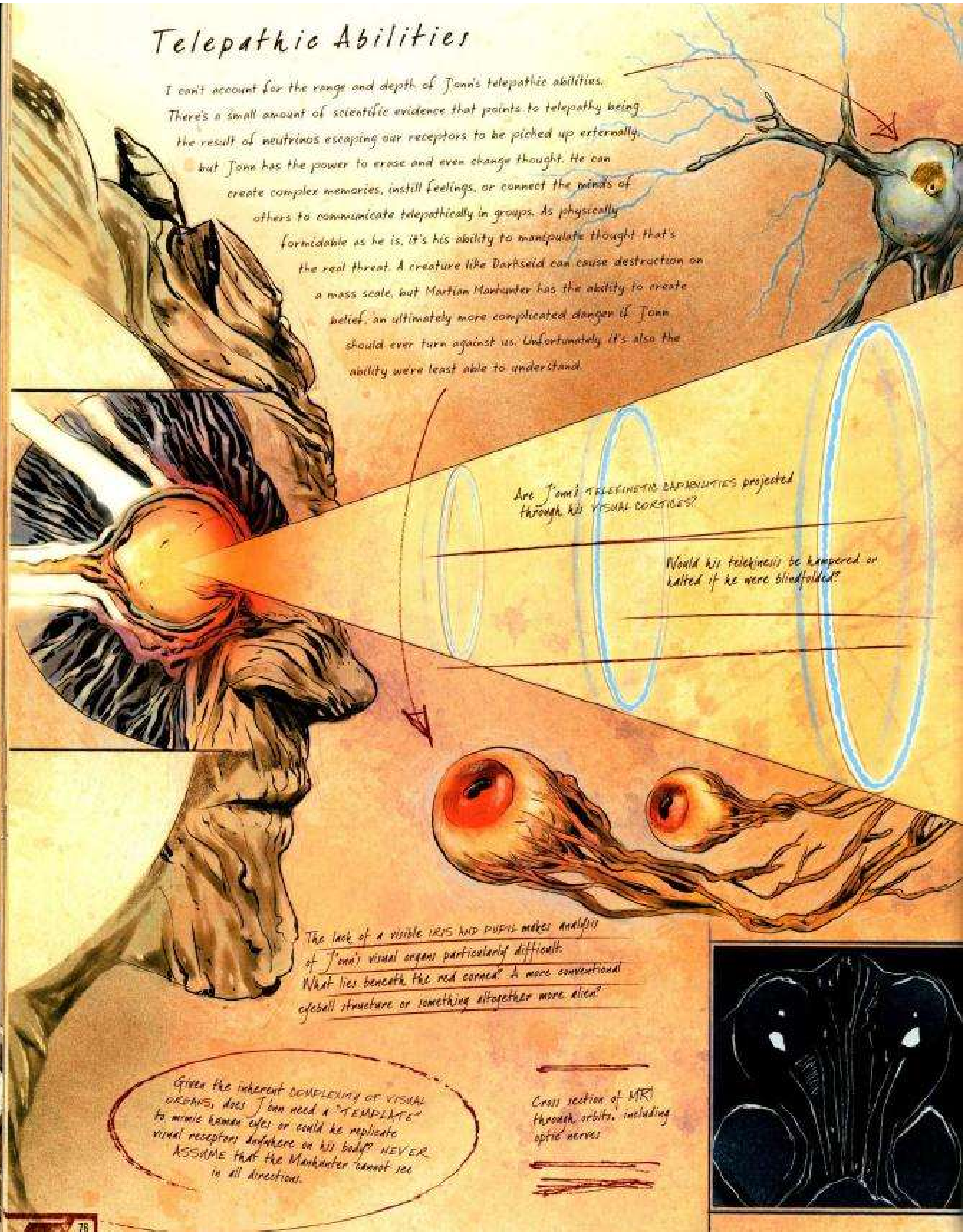


Theoretical study showing a section of J'onn's flesh at the moment of transformation from Martian form to human. The number of joules that would need to be generated to fuel such a change would no doubt be in the billions.

Another line of inquiry to explore: Is J'onn able to detach pieces of flesh and form multiple entities?

Telepathic Abilities

I can't account for the range and depth of J'onn's telepathic abilities. There's a small amount of scientific evidence that points to telepathy being the result of neutrinos escaping our receptors to be picked up externally, but J'onn has the power to erase and even change thought. He can create complex memories, instill feelings, or connect the minds of others to communicate telepathically in groups. As physically formidable as he is, it's his ability to manipulate thought that's the real threat. A creature like Darkseid can cause destruction on a mass scale, but Martian Manhunter has the ability to create belief, an ultimately more complicated danger if J'onn should ever turn against us. Unfortunately it's also the ability we're least able to understand.



Are J'onn's TELEKINETIC CAPABILITIES projected through his VISUAL CORTICES?

Would his telekinesis be hampered or halted if he were blindfolded?

The lack of a visible IRIS AND PUPIL makes analysis of J'onn's visual organs particularly difficult. What lies beneath the red cornea? A more conventional eyeball structure or something altogether more alien?

Given the inherent COMPLEXITY OF VISUAL ORGANS, does J'onn need a "TEMPLATE" to mimic human eyes or could he replicate visual receptors anywhere on his body? NEVER ASSUME that the Manhunter cannot see in all directions.

Cross section of MRI through orbits, including optic nerves

The thought processes of J'onn's species evolved along a very different path from those of humans— and on a considerably longer timeline. The efficiency of his thought manipulation seems the result of an advanced intelligent empathy, developed in a thought-sharing society.

From: Agent Cameron Chase <cchase@deo.gov>
Sent: Thursday, November 22 10:55 AM
To: Director Bones <mbones@deo.gov>
Subject: J'onn J'onzz

Director Bones,

As expected, the lead you had me check out was yet another dead end. If you're serious about tracking this guy, you're going to have to spring for more than taxi fares and a pair of fancy binoculars. This is an alien that can shake a tail by simply walking into a crowd. He can shape-shift at will. We're talking molecular level here. There's not even a stable radiation signature to follow. He's a blank page whenever he wants to be.

As I recommended before—what, twenty times now?—if we want to track the Martian Manhunter back to his colony or hippie commune or wherever the hell he lives, we're going to need significant manpower. Not only that, but you're going to have to have your lab boys cook up some kind of chemical that stays with him. Something we can track even when he ducks into the bathroom at a Sundollar Coffee as a disgruntled mailman and comes out a goth barista.

Frankly, I'm tired of chasing shadows just because you're too damn cheap to spring for a flashlight.

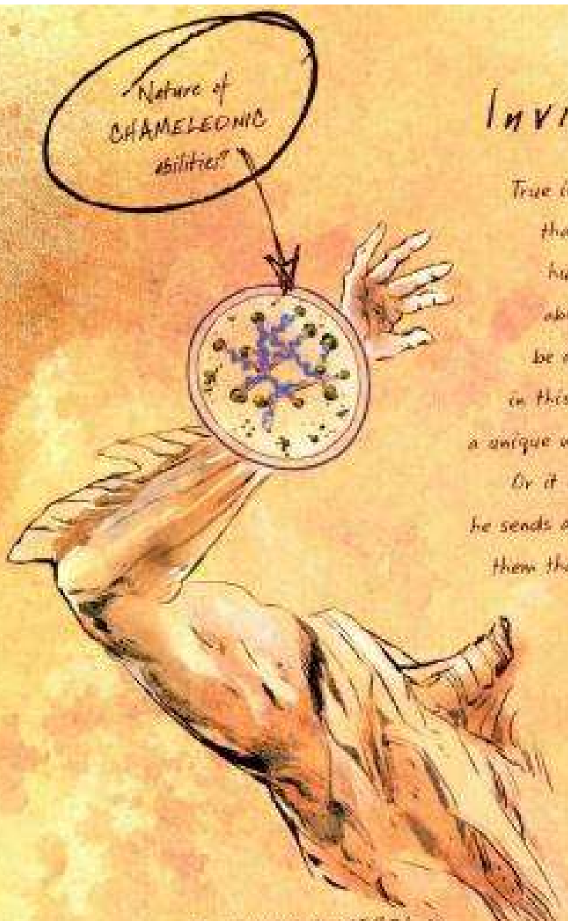
Lovingly yours,
Agent Cameron Chase
Department of Extranormal Operations

TOP SECRET

Unsurprisingly, J'onn has confounded those who have tried to track his movements. It seems like the DEO's efforts may intensify though, so it might be necessary for me to intervene to keep the Martian Manhunter out of their grasp. He's too important to the Justice League's operations to be waylaid for any amount of time.

Still unable to postulate how J'onn is able to see when "INVISIBLE." The nature of invisibility contradicts the use of retinal receptors. Does he "SEE" by accessing the minds of those nearby, or does he use some unknown sense of perception?

I don't know that there's any way to guard against thought manipulation, should J'onn choose to practice it on me. I've trained my mind over the years to detect foreign presences. Will that be enough? Has it been?


Nature of CHAMELEONIC abilities?
CELLULAR CONTROL to achieve transparency?

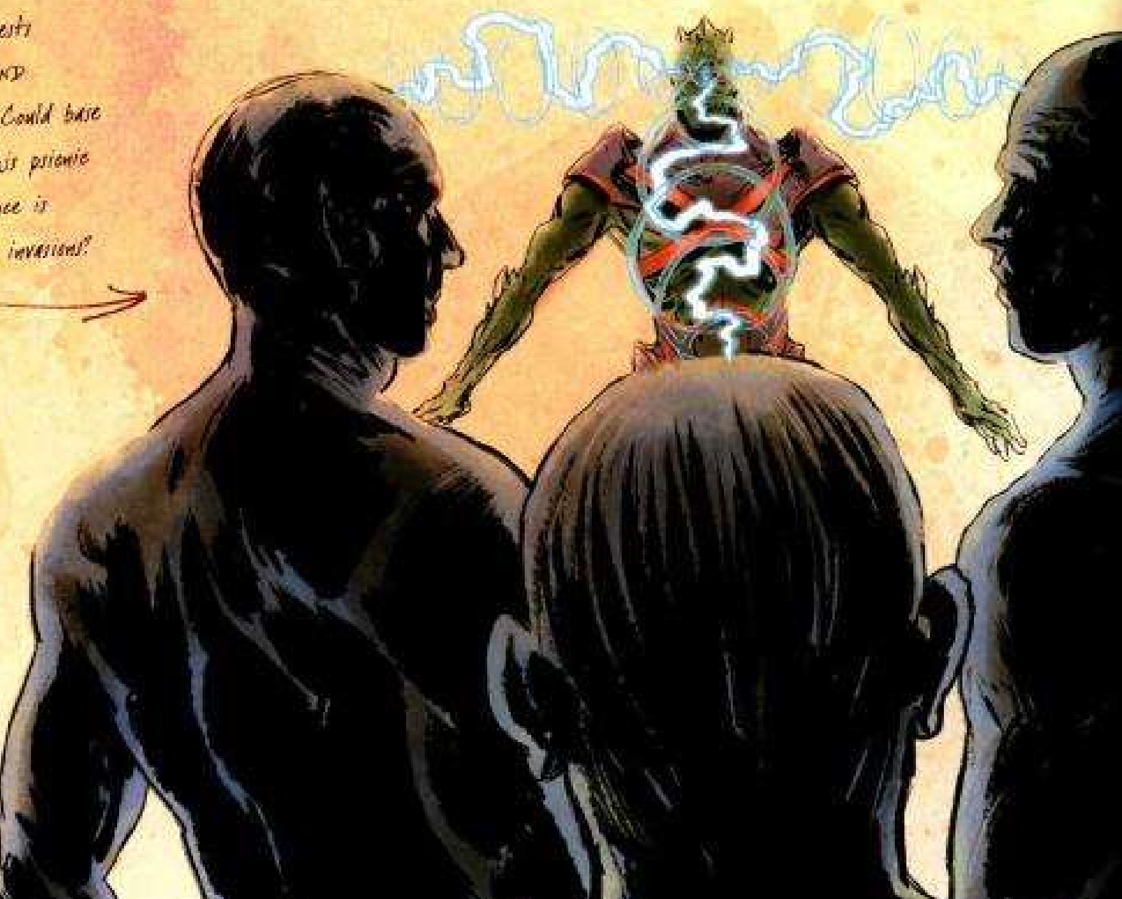
Invisibility

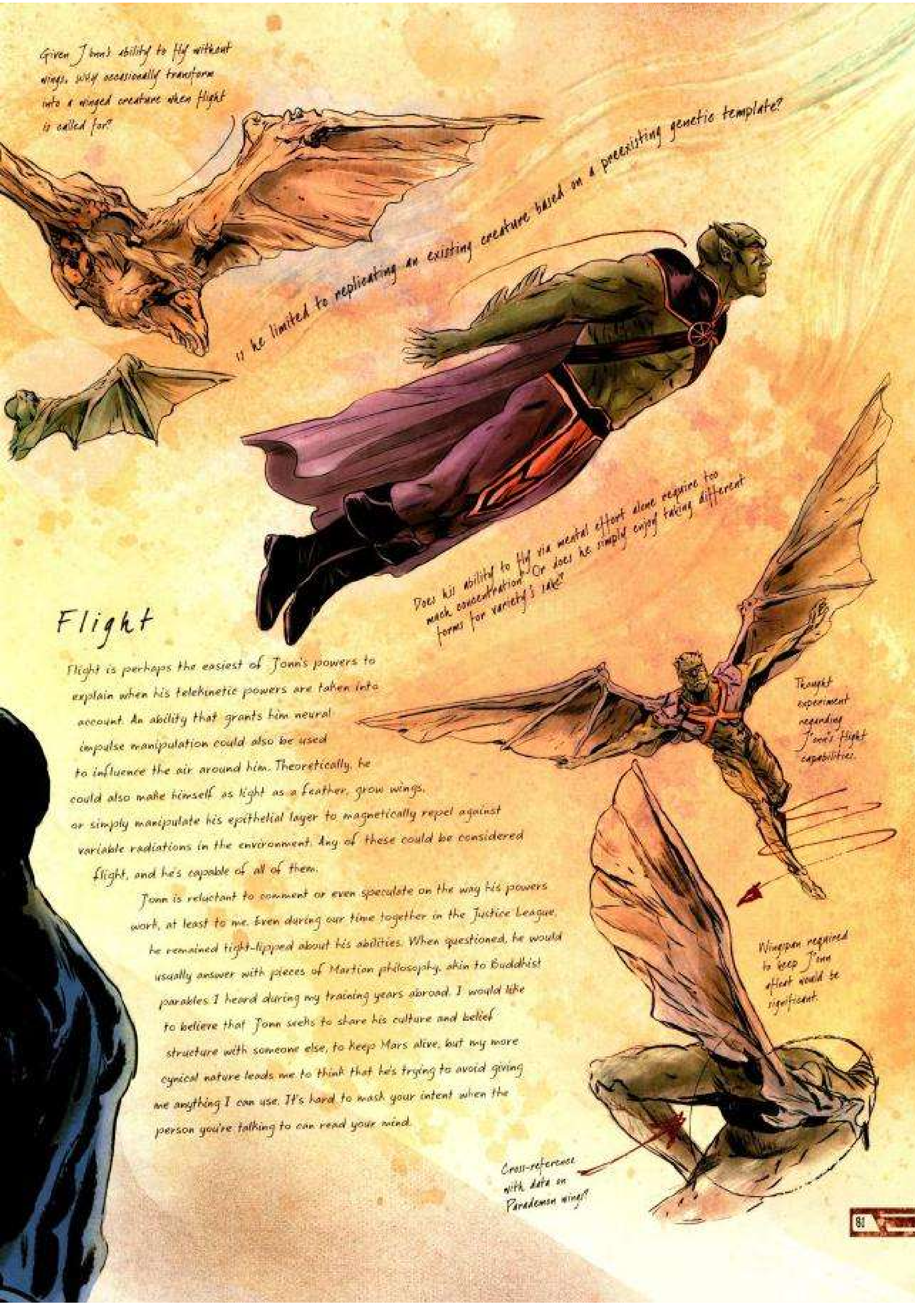
True invisibility is theoretically impossible for a multicellular creature, but we know that Jonn can disperse himself to the point where he cannot be detected by the human eye, appearing as nothing more than dust motes. In this state he is also able to pass through matter, or have matter pass through him. To do this, he must be able to create space between his atoms. How he can maintain consciousness as Jonn in this form isn't clear, but his inherent telepathic ability already suggests that he has a unique way of processing thought.

Or it could be that he uses a more direct method for hiding in plain sight. Perhaps he sends a strong telepathic message to the minds of those around him that convinces them that he's not there. Compared to creating false memories, a simple perception-block wouldn't strain his abilities. But that wouldn't explain a camera's inability to record him during his periods of "invisibility." Maybe he simply sidesteps into that theoretical dimensional shift he can access, to gain or shed mass. Obviously, this merits further research, as harnessing this type of ability would be a huge advantage in our particular field.

Maybe he can SELECTIVELY BLOCK PERCEPTION to simulate invisibility, but I'm missing something here. He can't dissolve into the air to simply be imperceptible, or how would he be able to reform?

ANECDOTAL EVIDENCE suggests he can project MIND-TO-MIND interaction at vast distances. Could base metal shielding block or slow his psionic capabilities? How much distance is required to halt his mental invasions?





Given J'onn's ability to fly without wings, why occasionally transform into a winged creature when flight is called for?

Is he limited to replicating an existing creature based on a preexisting genetic template?

Does his ability to fly via mental effort alone require too much concentration? Or does he simply enjoy taking different forms for variety's sake?

Thought experiment regarding J'onn's flight capabilities.

Wingspan required to keep J'onn aloft would be significant.

Cross-reference with data on Parademon wings?

Flight

Flight is perhaps the easiest of J'onn's powers to explain when his telekinetic powers are taken into account. An ability that grants him neural impulse manipulation could also be used to influence the air around him. Theoretically, he could also make himself as light as a feather, grow wings, or simply manipulate his epithelial layer to magnetically repel against variable radiations in the environment. Any of these could be considered flight, and he's capable of all of them.

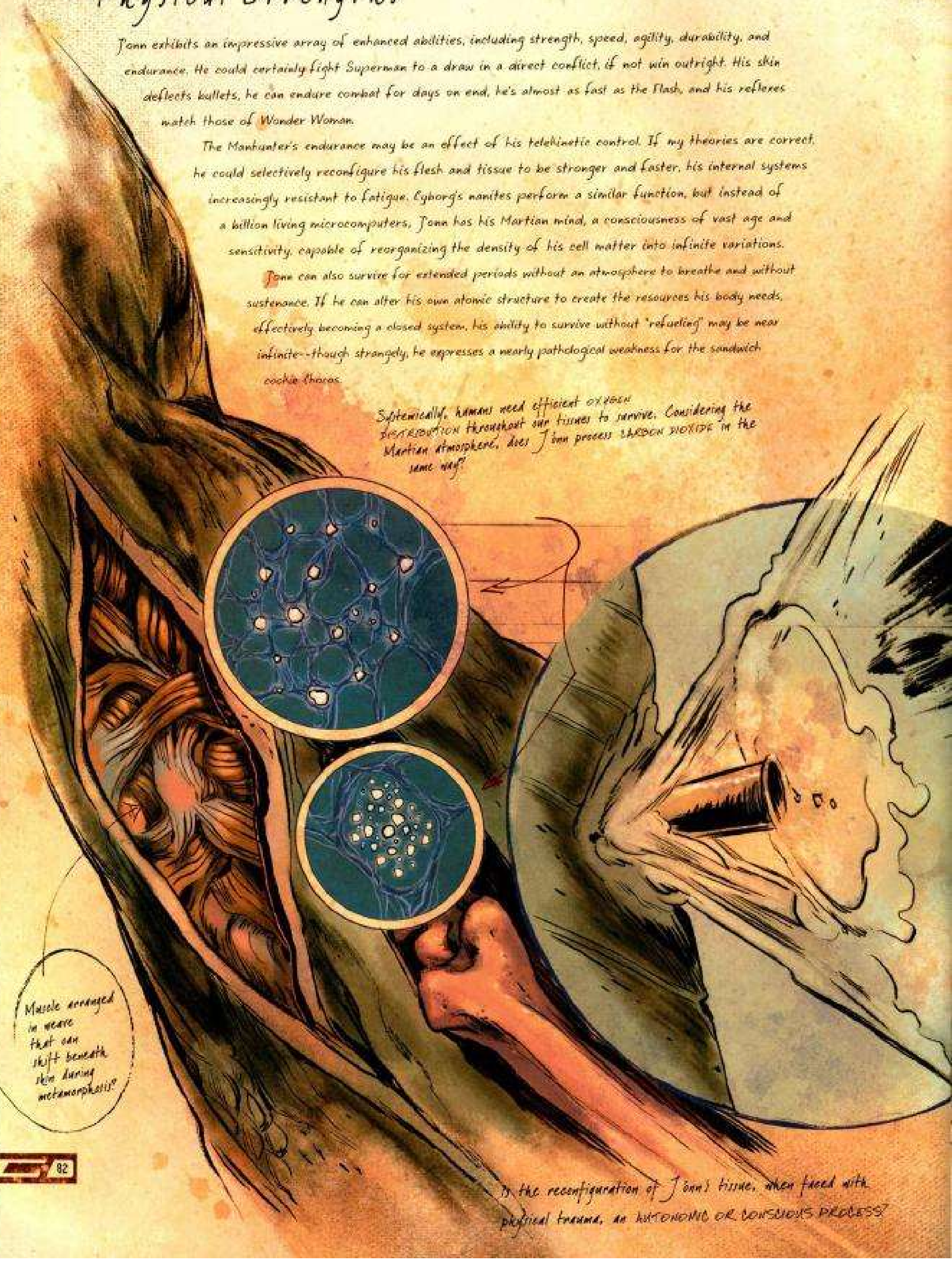
J'onn is reluctant to comment or even speculate on the way his powers work, at least to me. Even during our time together in the Justice League, he remained tight-lipped about his abilities. When questioned, he would usually answer with pieces of Martian philosophy, akin to Buddhist parables I heard during my training years abroad. I would like to believe that J'onn seeks to share his culture and belief structure with someone else, to keep Mars alive, but my more cynical nature leads me to think that he's trying to avoid giving me anything I can use. It's hard to mask your intent when the person you're talking to can read your mind.

Physical Strengths

J'onn exhibits an impressive array of enhanced abilities, including strength, speed, agility, durability, and endurance. He could certainly fight Superman to a draw in a direct conflict, if not win outright. His skin deflects bullets, he can endure combat for days on end, he's almost as fast as the Flash, and his reflexes match those of Wonder Woman.

The Manhunter's endurance may be an effect of his telekinetic control. If my theories are correct, he could selectively reconfigure his flesh and tissue to be stronger and faster, his internal systems increasingly resistant to fatigue. Cyborg's nanites perform a similar function, but instead of a billion living microcomputers, J'onn has his Martian mind, a consciousness of vast age and sensitivity, capable of reorganizing the density of his cell matter into infinite variations.

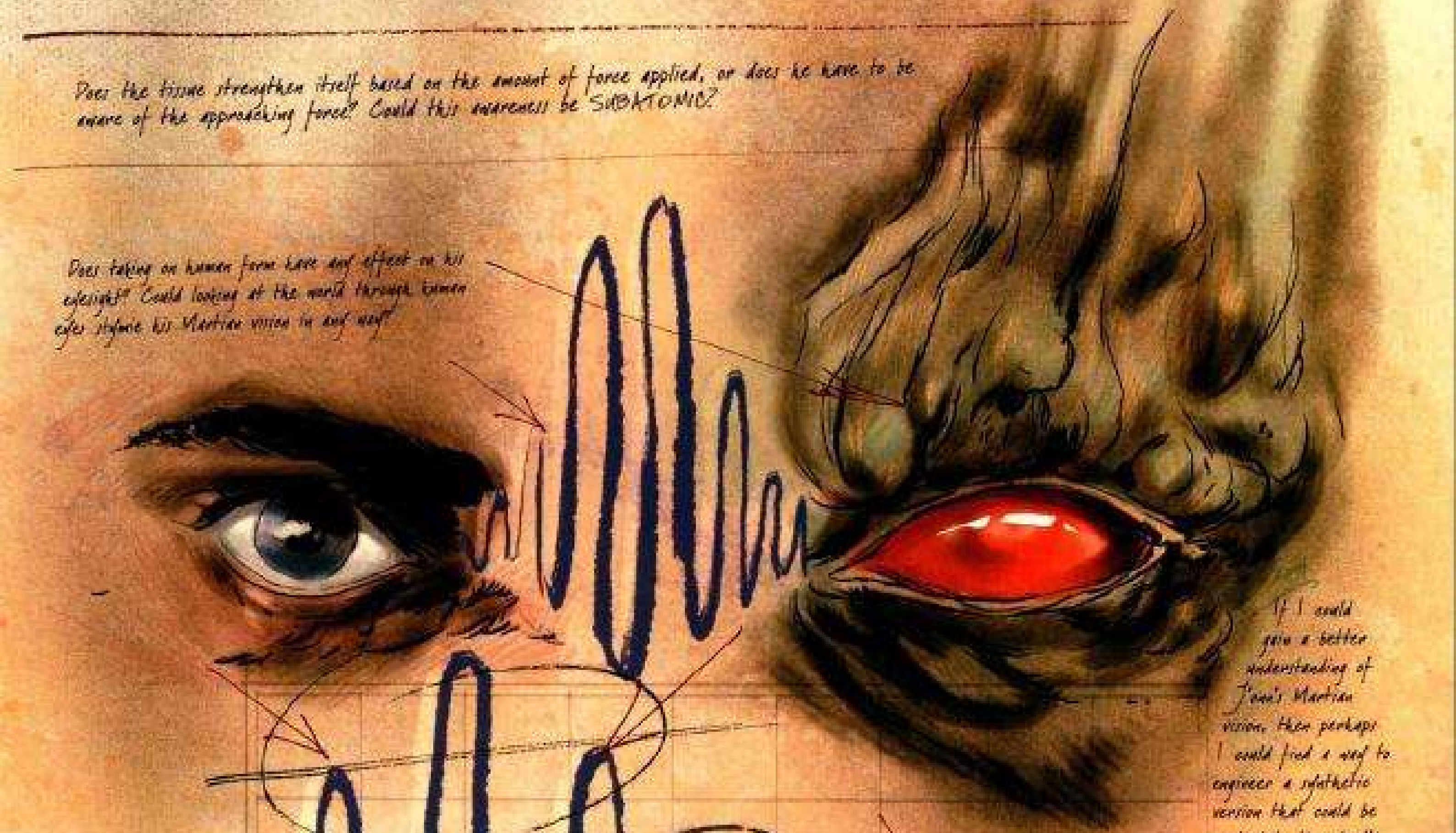
J'onn can also survive for extended periods without an atmosphere to breathe and without sustenance. If he can alter his own atomic structure to create the resources his body needs, effectively becoming a closed system, his ability to survive without "refueling" may be near infinite--though strangely, he expresses a nearly pathological weakness for the sandwich cookie Choccos.



Systemically, humans need efficient OXYGEN DISTRIBUTION throughout our tissues to survive. Considering the Martian atmosphere, does J'onn process CARBON DIOXIDE in the same way?

Muscle arranged in weave that can shift beneath skin during metamorphosis?

Is the reconfiguration of J'onn's tissue, when faced with physical trauma, an AUTONOMIC OR CONSCIOUS PROCESS?



Does the tissue strengthen itself based on the amount of force applied, or does he have to be aware of the approaching force? Could this awareness be SUBATOMIC?

Does taking on human form have any effect on his eyesight? Could looking at the world through human eyes stymie his Martian vision in any way?

If I could gain a better understanding of J'onn's Martian vision, then perhaps I could find a way to engineer a synthetic version that could be applied to the stealth optics in my cowl.

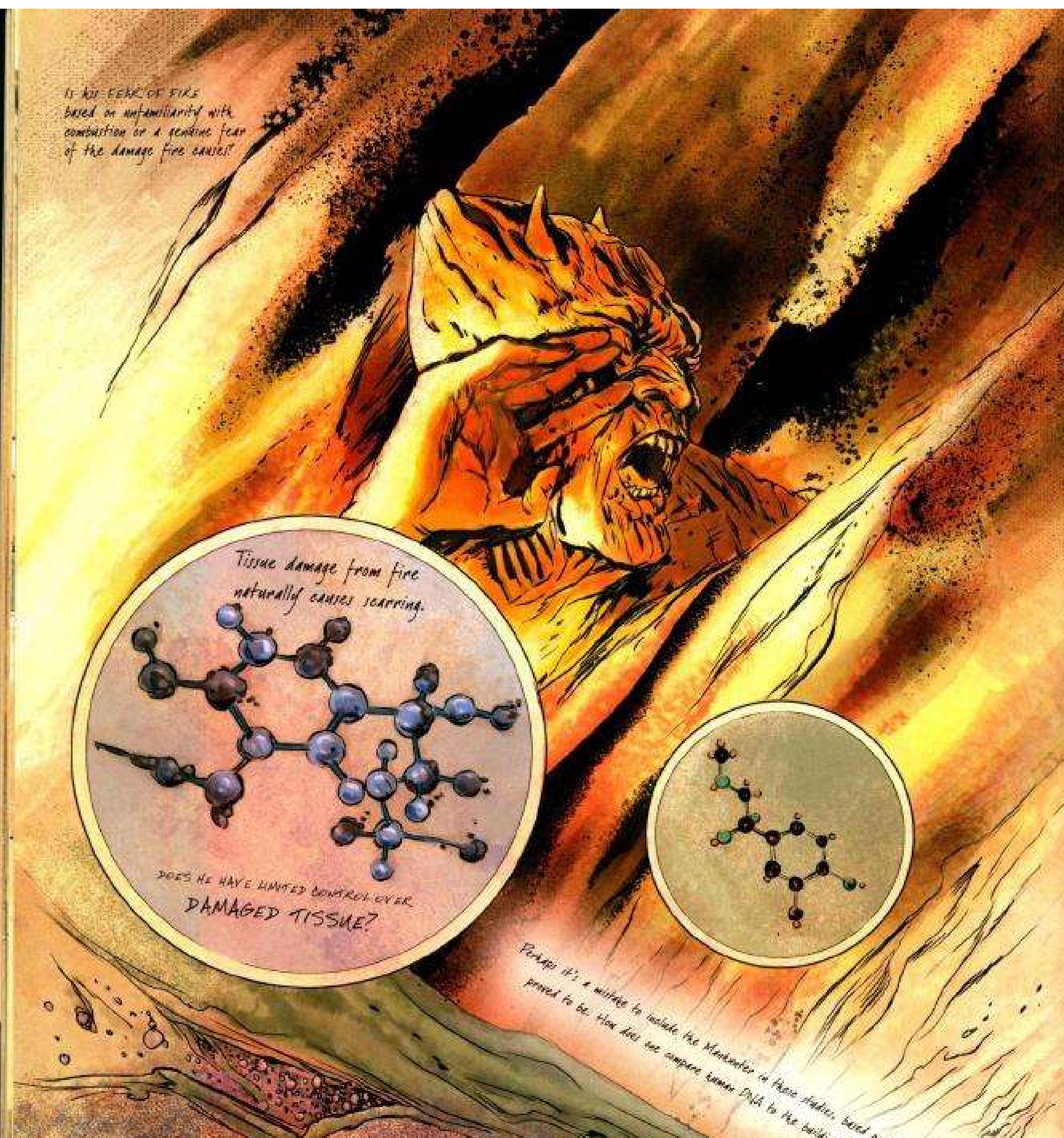
STANDARD AMMUNITION CANNOT PIERCE HIS MARTIAN SKIN.

I've heard it said that J'onn has a total of nine senses, but at this time I've not been able to confirm despite my best efforts to map his abilities.

Martian Vision

In addition to having eyesight as exceptional as any being I've researched so far, Martian Manhunter also has a form of X-ray sight that he refers to as "Martian Vision." He describes it as mapping variable density wave packets, a concept that is frankly beyond my current level of understanding.

The problem with trying to describe an alien sense is the lack of reference--as much as I hate to resort to cliche, it was as if J'onn was trying to describe sight to a blind man. His Martian physiology must allow him access to sensory spectrums we can't begin to comprehend, because they are completely outside of our experience.



Is his FEAR OF FIRE based on unfamiliarity with combustion or a genuine fear of the damage fire causes?

Tissue damage from fire naturally causes scarring.

DOES HE HAVE LIMITED CONTROL OVER DAMAGED TISSUE?

Perhaps it's a mistake to include the Manhunter in these studies, based on how speculative this research has proved to be. How does one compare human DNA to the building blueprints of an unstudied species?

Weaknesses

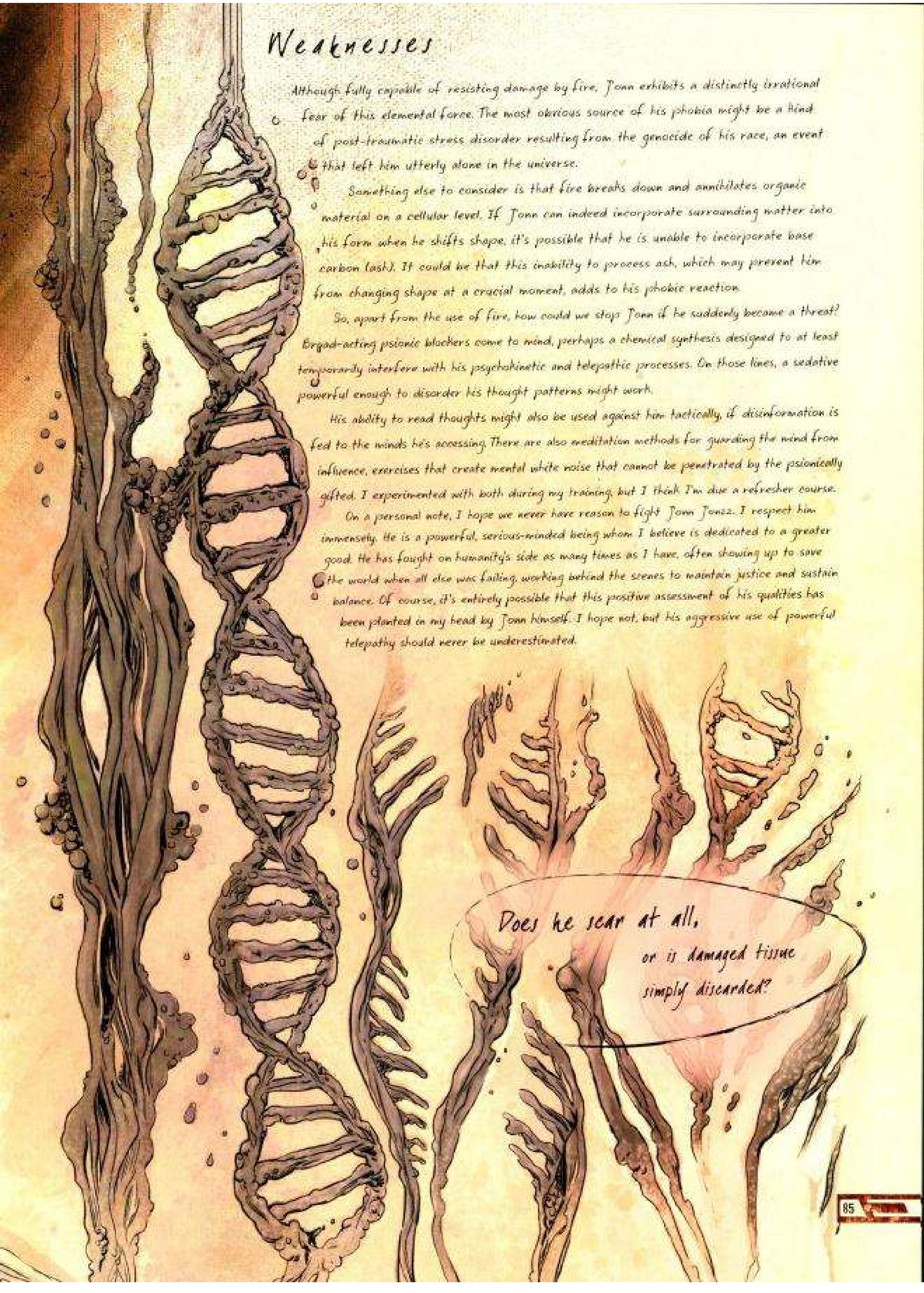
Although fully capable of resisting damage by fire, J'onn exhibits a distinctly irrational fear of this elemental force. The most obvious source of his phobia might be a kind of post-traumatic stress disorder resulting from the genocide of his race, an event that left him utterly alone in the universe.

Something else to consider is that fire breaks down and annihilates organic material on a cellular level. If J'onn can indeed incorporate surrounding matter into his form when he shifts shape, it's possible that he is unable to incorporate base carbon (ash). It could be that this inability to process ash, which may prevent him from changing shape at a crucial moment, adds to his phobic reaction.

So, apart from the use of fire, how could we stop J'onn if he suddenly became a threat? Broad-acting psionic blockers come to mind, perhaps a chemical synthesis designed to at least temporarily interfere with his psychokinetic and telepathic processes. On those lines, a sedative powerful enough to disorder his thought patterns might work.

His ability to read thoughts might also be used against him tactically, if disinformation is fed to the minds he's accessing. There are also meditation methods for guarding the mind from influence, exercises that create mental white noise that cannot be penetrated by the psionically gifted. I experimented with both during my training, but I think I'm due a refresher course.

On a personal note, I hope we never have reason to fight J'onn J'onzz. I respect him immensely. He is a powerful, serious-minded being whom I believe is dedicated to a greater good. He has fought on humanity's side as many times as I have, often showing up to save the world when all else was failing, working behind the scenes to maintain justice and sustain balance. Of course, it's entirely possible that this positive assessment of his qualities has been planted in my head by J'onn himself. I hope not, but his aggressive use of powerful telepathy should never be underestimated.



Does he scar at all,
or is damaged tissue
simply discarded?

SWAMP THING

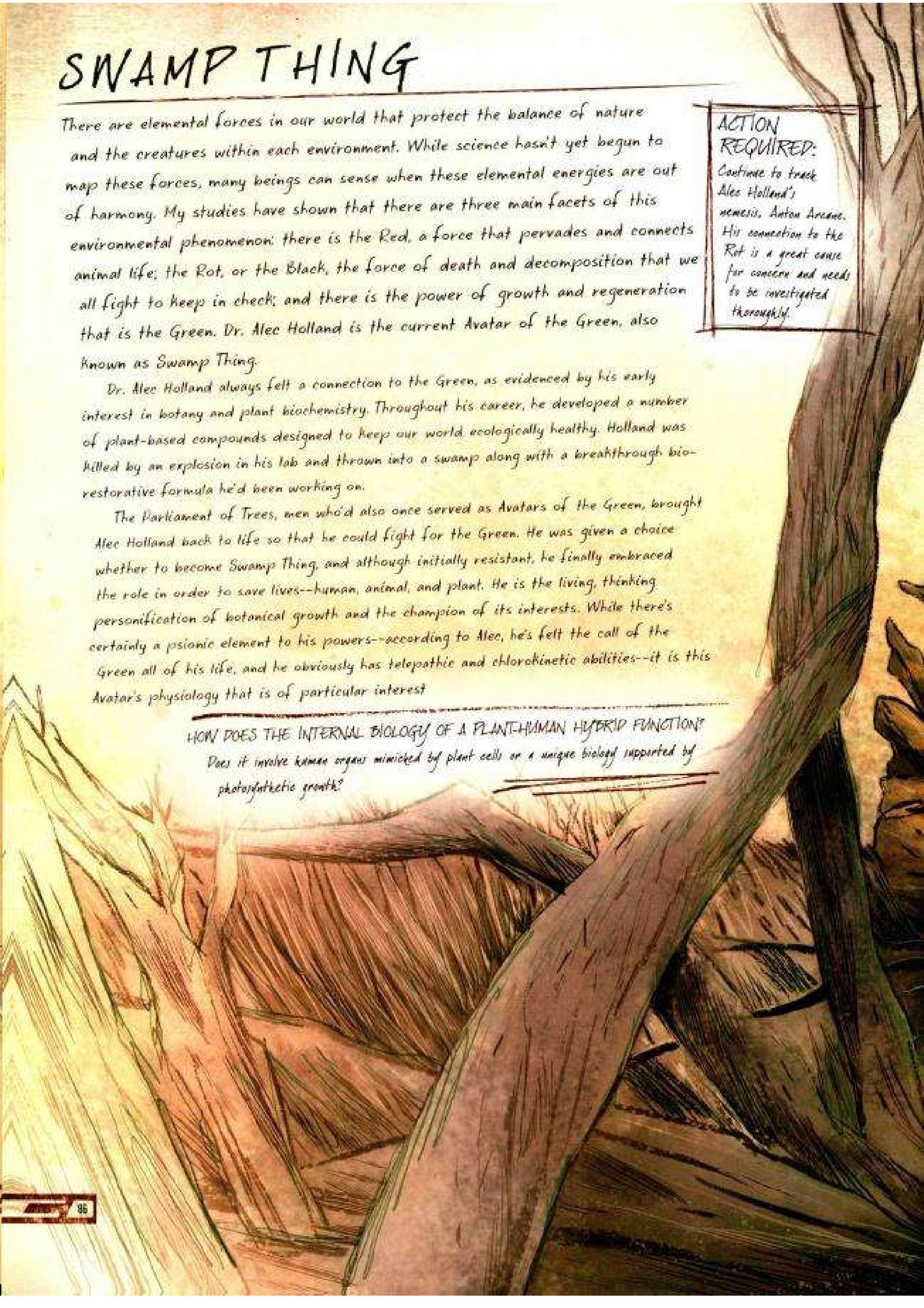
There are elemental forces in our world that protect the balance of nature and the creatures within each environment. While science hasn't yet begun to map these forces, many beings can sense when these elemental energies are out of harmony. My studies have shown that there are three main facets of this environmental phenomenon: there is the Red, a force that pervades and connects animal life; the Rot, or the Black, the force of death and decomposition that we all fight to keep in check; and there is the power of growth and regeneration that is the Green. Dr. Alec Holland is the current Avatar of the Green, also known as Swamp Thing.

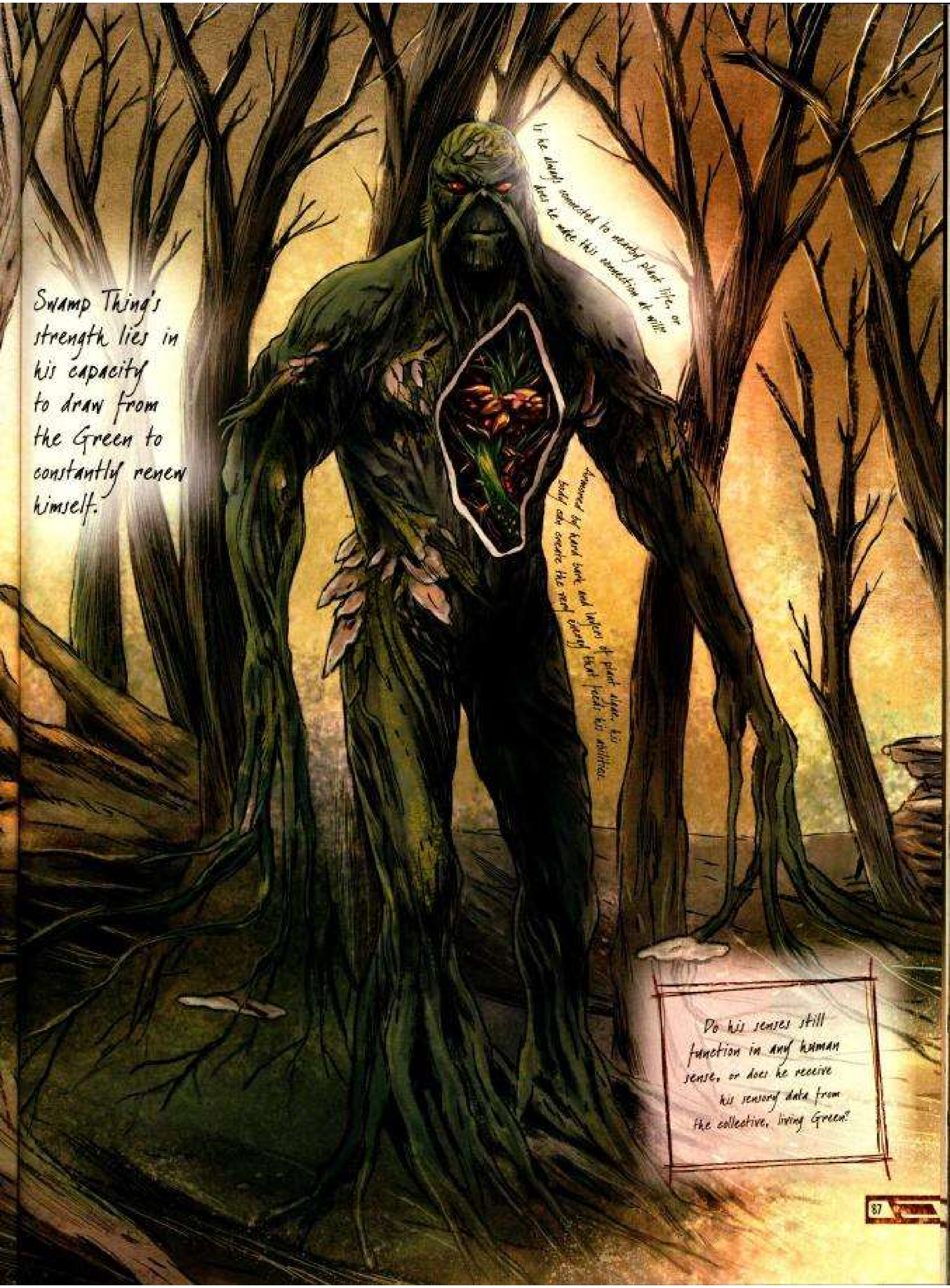
Dr. Alec Holland always felt a connection to the Green, as evidenced by his early interest in botany and plant biochemistry. Throughout his career, he developed a number of plant-based compounds designed to keep our world ecologically healthy. Holland was killed by an explosion in his lab and thrown into a swamp along with a breakthrough bio-restorative formula he'd been working on.

The Parliament of Trees, men who'd also once served as Avatars of the Green, brought Alec Holland back to life so that he could fight for the Green. He was given a choice whether to become Swamp Thing, and although initially resistant, he finally embraced the role in order to save lives--human, animal, and plant. He is the living, thinking personification of botanical growth and the champion of its interests. While there's certainly a psionic element to his powers--according to Alec, he's felt the call of the Green all of his life, and he obviously has telepathic and chlorokinetic abilities--it is this Avatar's physiology that is of particular interest

ACTION REQUIRED:
Continue to track Alec Holland's nemesis, Anton Arcane. His connection to the Rot is a great cause for concern and needs to be investigated thoroughly.

HOW DOES THE INTERNAL BIOLOGY OF A PLANT-HUMAN HYBRID FUNCTION? Does it involve human organs mimicked by plant cells or a unique biology supported by photosynthetic growth?



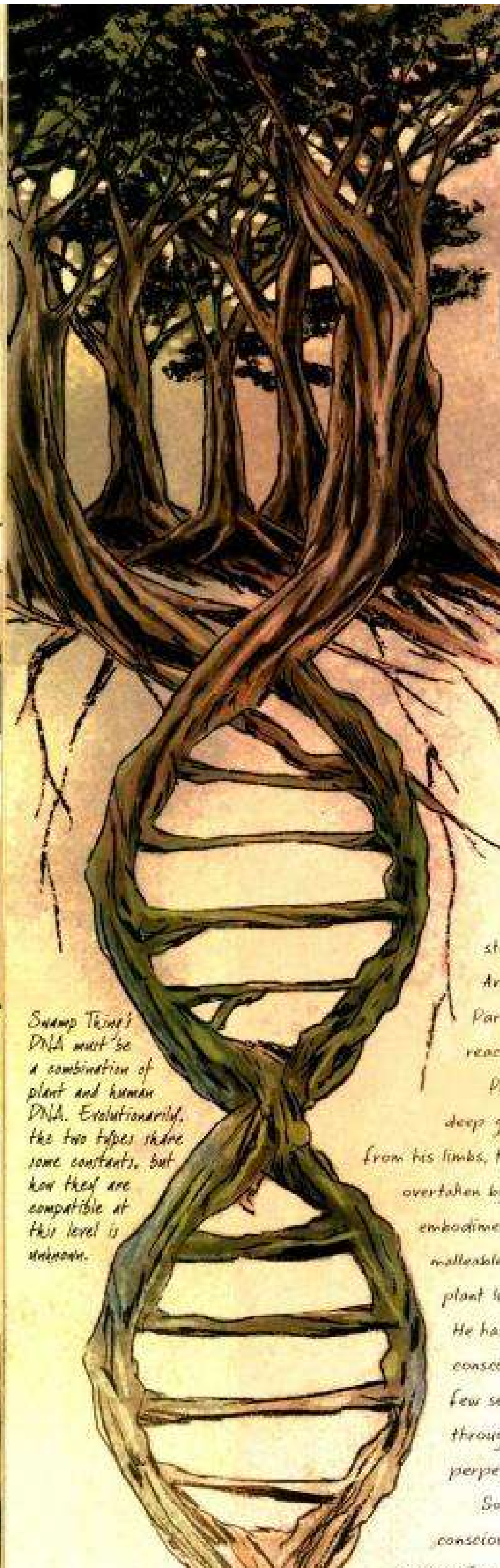


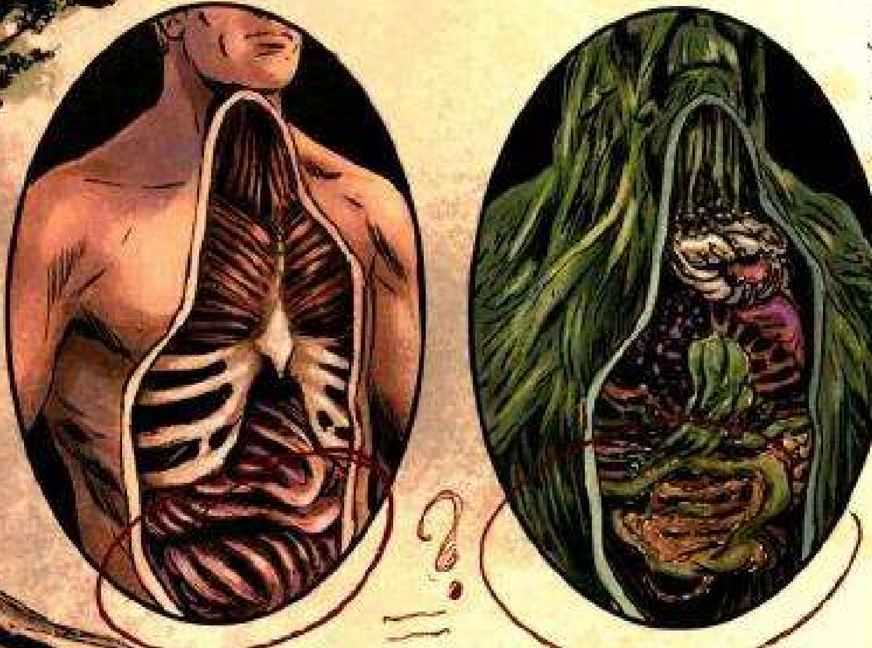
Swamp Thing's strength lies in his capacity to draw from the Green to constantly renew himself.

Is he always connected to nearby plant life, or does he make this connection at will?

Armoured by hard bark and layers of plant algae, his body can create the very energy that feeds his abilities.

Do his senses still function in any human sense, or does he receive his sensory data from the collective, living Green?





Is it blood that flows through his veins, or sap, or some amalgam of the two?

A humanlike system supported by variegated plant cells?

Or a fundamentally different biology that only relies on musculoskeletal structure for form?

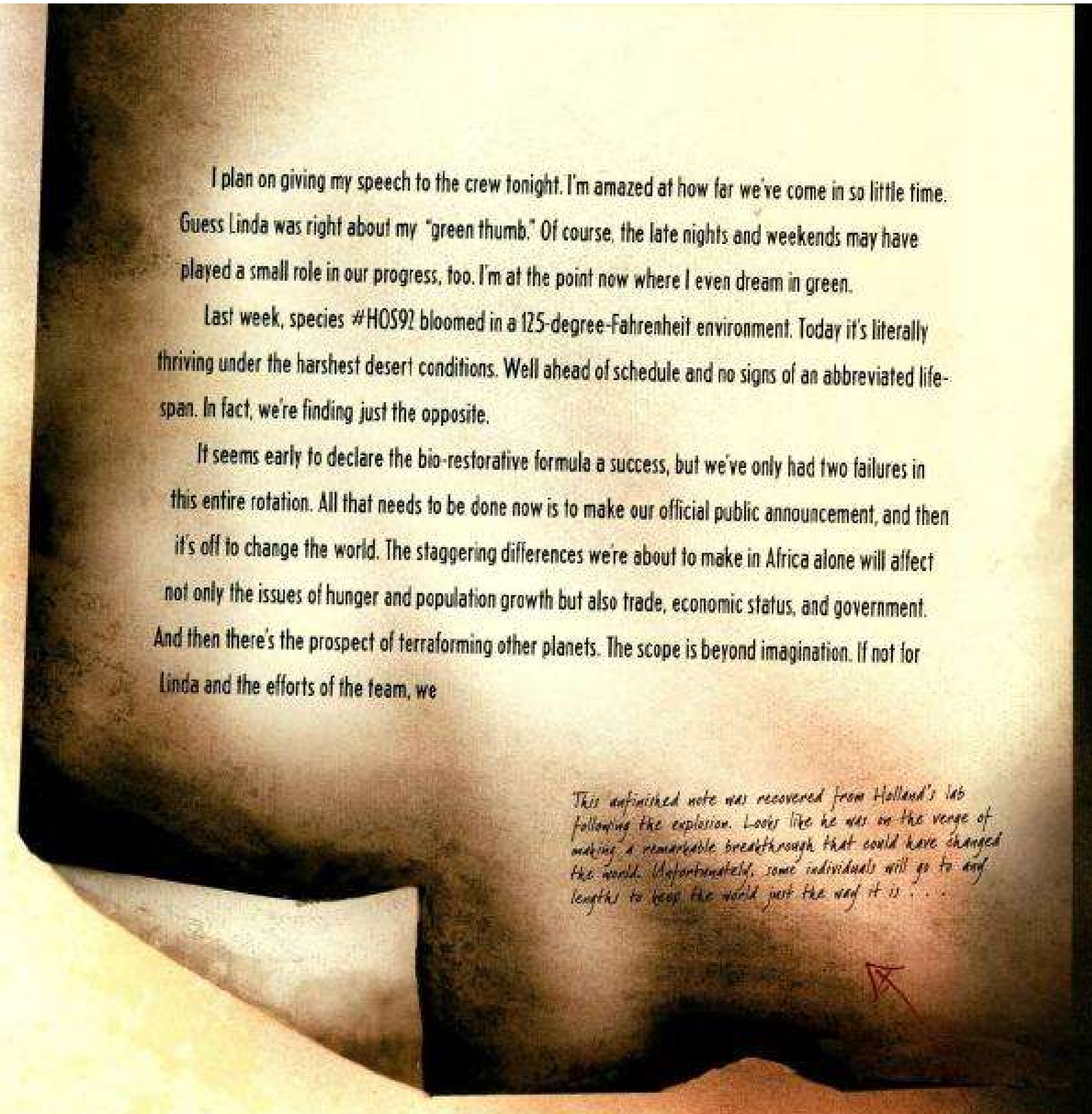
Origin

According to Swamp Thing, the Green has chosen humans throughout our brief history to serve as its protector, calling to a chosen few through the collective voice of the Green. If the time and circumstances are right, the person is "taken" by the Green and transformed into Swamp Thing. Swamp Thing's power lies in the control of living green plants but also in the human restraint he or she can exhibit, striving to create balance for the Green rather than seek domination. When the Avatar's form finally dies, the being takes root alongside other past Avatars. This Parliament of Trees collectively makes decisions on behalf of the Green, including reaching out to humans who might one day be invited to serve.

Physically, Swamp Thing is humanoid; we see the shape of the man beneath thick, deep green flesh, which seems to always be growing--branches and leaves sprouting from his limbs, torso, and face. Heavy, bark-like armor has formed across his body and is overtaken by more layers of green: vines, grasses, saplings, and flowers. He is the physical embodiment of the Green, meant to be its warrior. I have learned that Alec's form is now malleable: He no longer has a human core, and he can reform himself from any available plant life. He can tower over the tallest men or appear as the grass beneath their feet. He has trained to be one with the Green and has exhibited the ability to project his consciousness into any form of plant life, growing his own Avatar body from even a few seeds if need be. This is probably his biggest advantage in combat. Bullets pass through him with little effect. As the living embodiment of growth and regrowth, he is perpetually restored by the Green.

Swamp Thing's DNA must be a combination of plant and human DNA. Evolutionarily, the two types share some constants, but how they are compatible at this level is unknown.

So how does the Green transform a man into an Avatar? Alec Holland's consciousness is inside that mass of vegetation, but is he still clinically human? I believe Swamp Thing is a hybrid of the Green and Dr. Holland, his human genetic code entirely rewritten. His own cells were somehow physically replicated as plant stem cells, but stem cells capable of creating a working facsimile of specific animal cells--whatever was still necessary to provide nutrients to Dr. Holland's brain and its support systems.



I plan on giving my speech to the crew tonight. I'm amazed at how far we've come in so little time. Guess Linda was right about my "green thumb." Of course, the late nights and weekends may have played a small role in our progress, too. I'm at the point now where I even dream in green.

Last week, species #HOS92 bloomed in a 125-degree-Fahrenheit environment. Today it's literally thriving under the harshest desert conditions. Well ahead of schedule and no signs of an abbreviated lifespan. In fact, we're finding just the opposite.

It seems early to declare the bio-restorative formula a success, but we've only had two failures in this entire rotation. All that needs to be done now is to make our official public announcement, and then it's off to change the world. The staggering differences we're about to make in Africa alone will affect not only the issues of hunger and population growth but also trade, economic status, and government. And then there's the prospect of terraforming other planets. The scope is beyond imagination. If not for Linda and the efforts of the team, we

This unfinished note was recovered from Holland's lab following the explosion. Looks like he was on the verge of making a remarkable breakthrough that could have changed the world. Unfortunately, some individuals will go to any lengths to keep the world just the way it is . . .

Swamp Thing has a working mind, with synapses and memories and a vestibular system, but I don't believe it's powered by pumping blood. Rather, he lives by a combination of photosynthesis and the bio-restorative's self-replicating process. He can control his own growth, creating appendages at will, gaining mass as needed.

Consider tree roots cracking concrete and growing through the gaps or the organic tensile strength of a heavy wood, and you have an idea of the physical strength of one of these Avatars. Consider also that we're talking about an elemental force. When Swamp Thing's body sustains serious injury, his consciousness can be regrown into another Avatar. Or perhaps he will take root with the Parliament, and another Swamp Thing will be called upon to serve. Either way, these beings are relentless and hard to stop for any length of time.

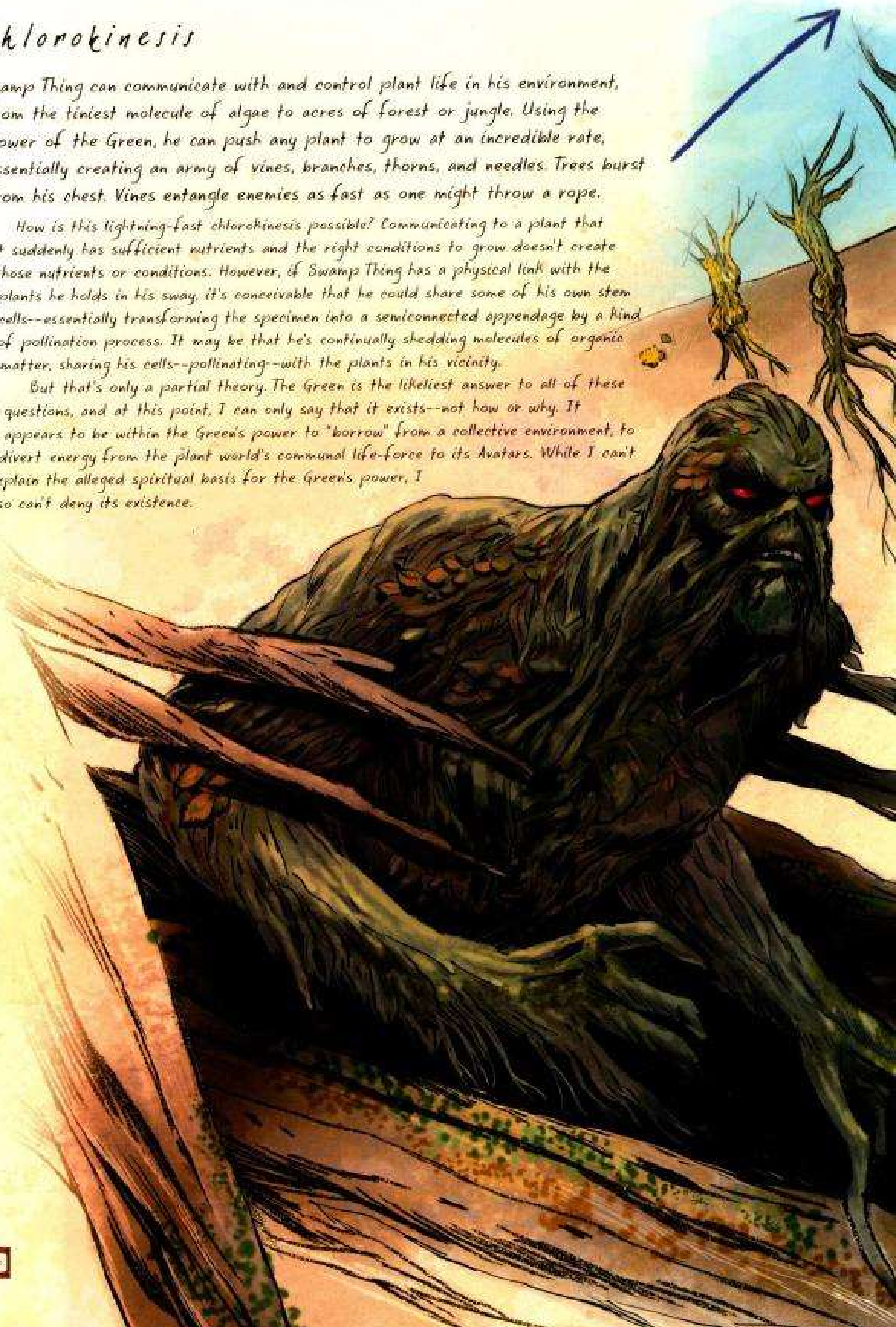
Dr. Holland's discovery would have meant a great deal to the hungry people of the world, but it had the potential to be a substantial blow to agricultural corporate interests. I'm not satisfied that the explosion that led to his death was fully investigated.

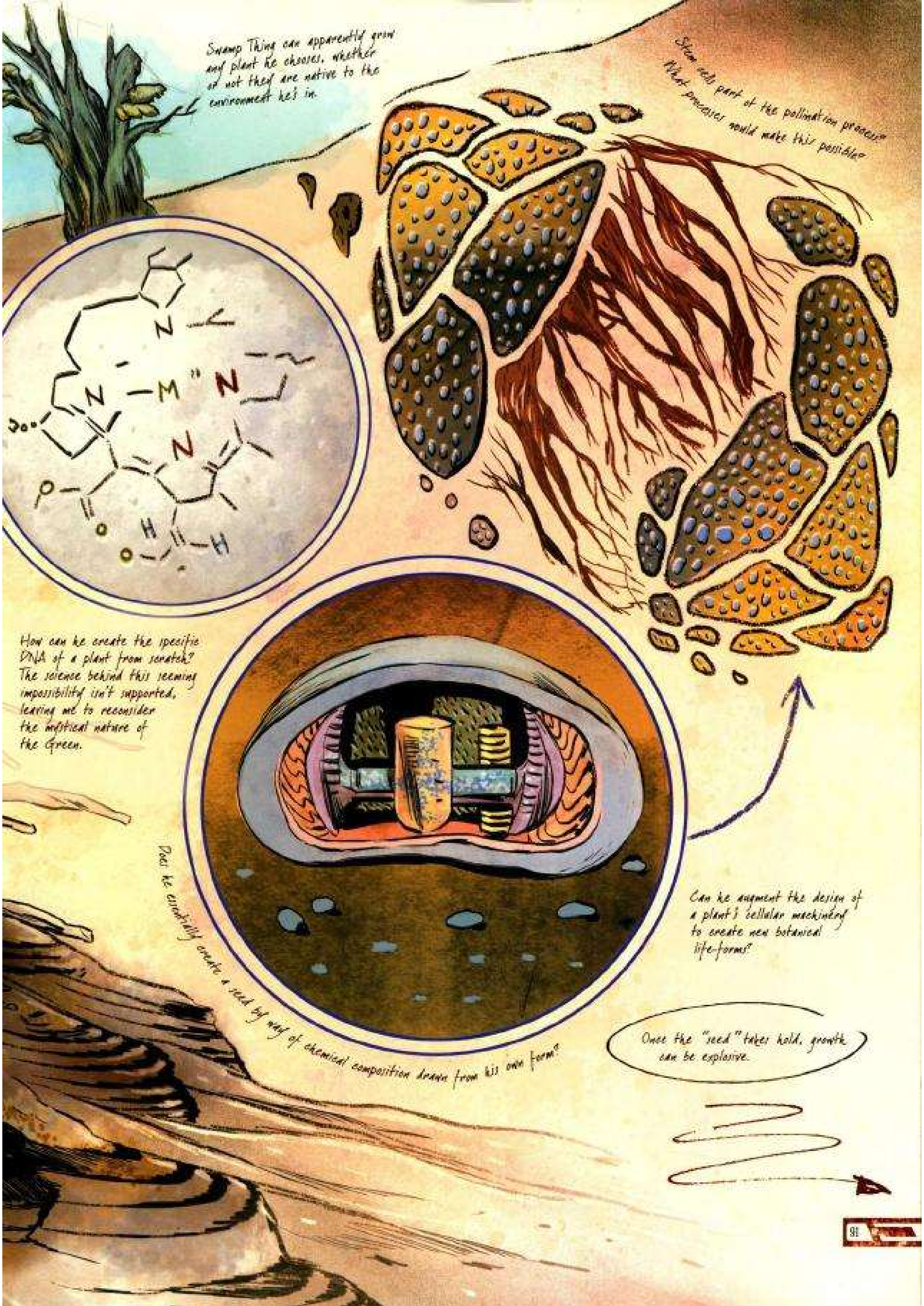
Chlorokinesis

Swamp Thing can communicate with and control plant life in his environment, from the tiniest molecule of algae to acres of forest or jungle. Using the power of the Green, he can push any plant to grow at an incredible rate, essentially creating an army of vines, branches, thorns, and needles. Trees burst from his chest. Vines entangle enemies as fast as one might throw a rope.

How is this lightning-fast chlorokinesis possible? Communicating to a plant that it suddenly has sufficient nutrients and the right conditions to grow doesn't create those nutrients or conditions. However, if Swamp Thing has a physical link with the plants he holds in his sway, it's conceivable that he could share some of his own stem cells--essentially transforming the specimen into a semiconnected appendage by a kind of pollination process. It may be that he's continually shedding molecules of organic matter, sharing his cells--pollinating--with the plants in his vicinity.

But that's only a partial theory. The Green is the likeliest answer to all of these questions, and at this point, I can only say that it exists--not how or why. It appears to be within the Green's power to "borrow" from a collective environment, to divert energy from the plant world's communal life-force to its Avatars. While I can't explain the alleged spiritual basis for the Green's power, I also can't deny its existence.





Swamp Thing can apparently grow any plant he chooses, whether or not they are native to the environment he's in.

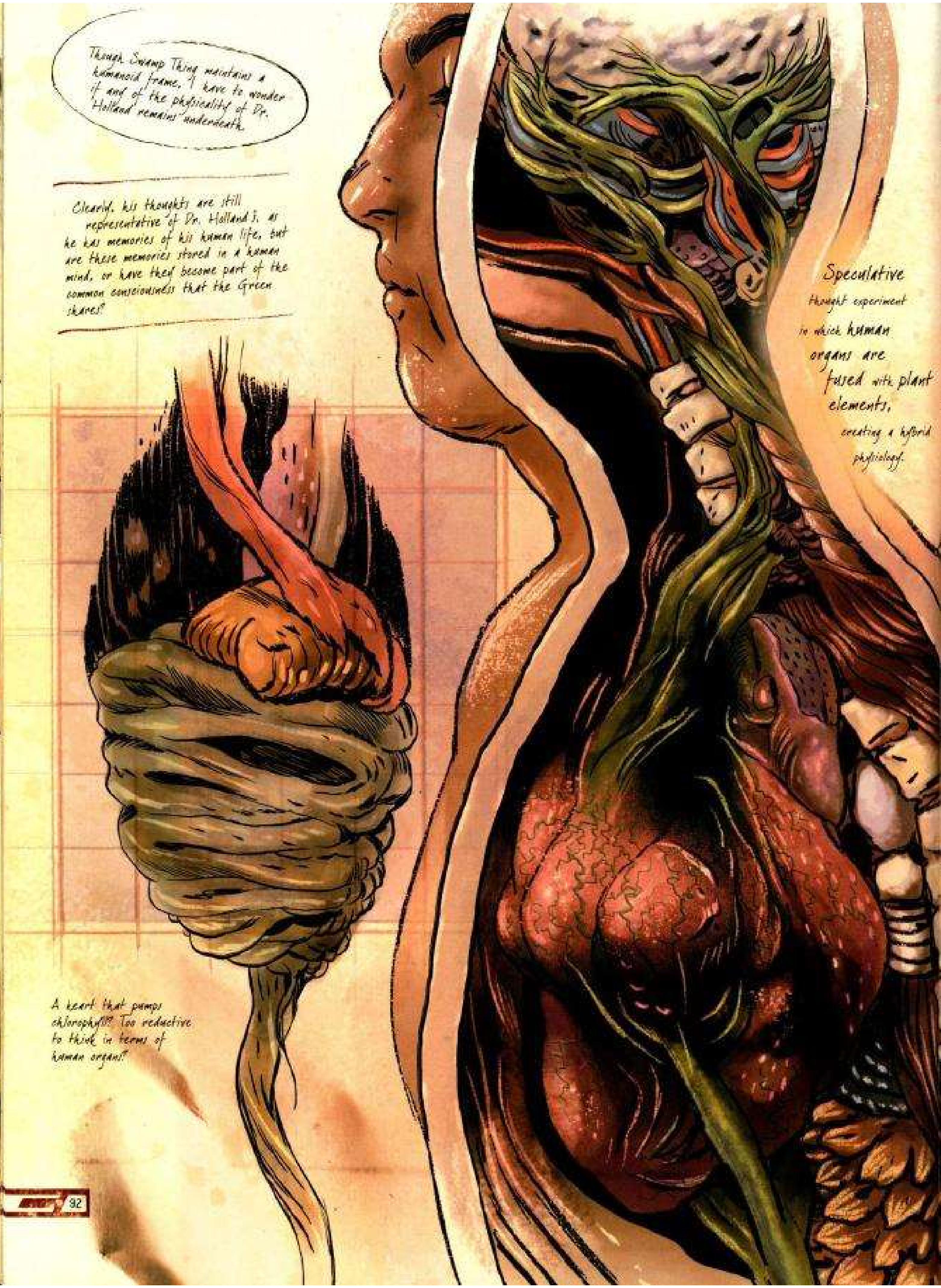
Stem cells part of the pollination process? What processes would make this possible?

How can he create the specific DNA of a plant from scratch? The science behind this seeming impossibility isn't supported, leaving me to reconsider the mystical nature of the Green.

Does he essentially create a seed by way of chemical composition drawn from his own form?

Can he augment the design of a plant's cellular machinery to create new botanical life-forms?

Once the "seed" takes hold, growth can be explosive.

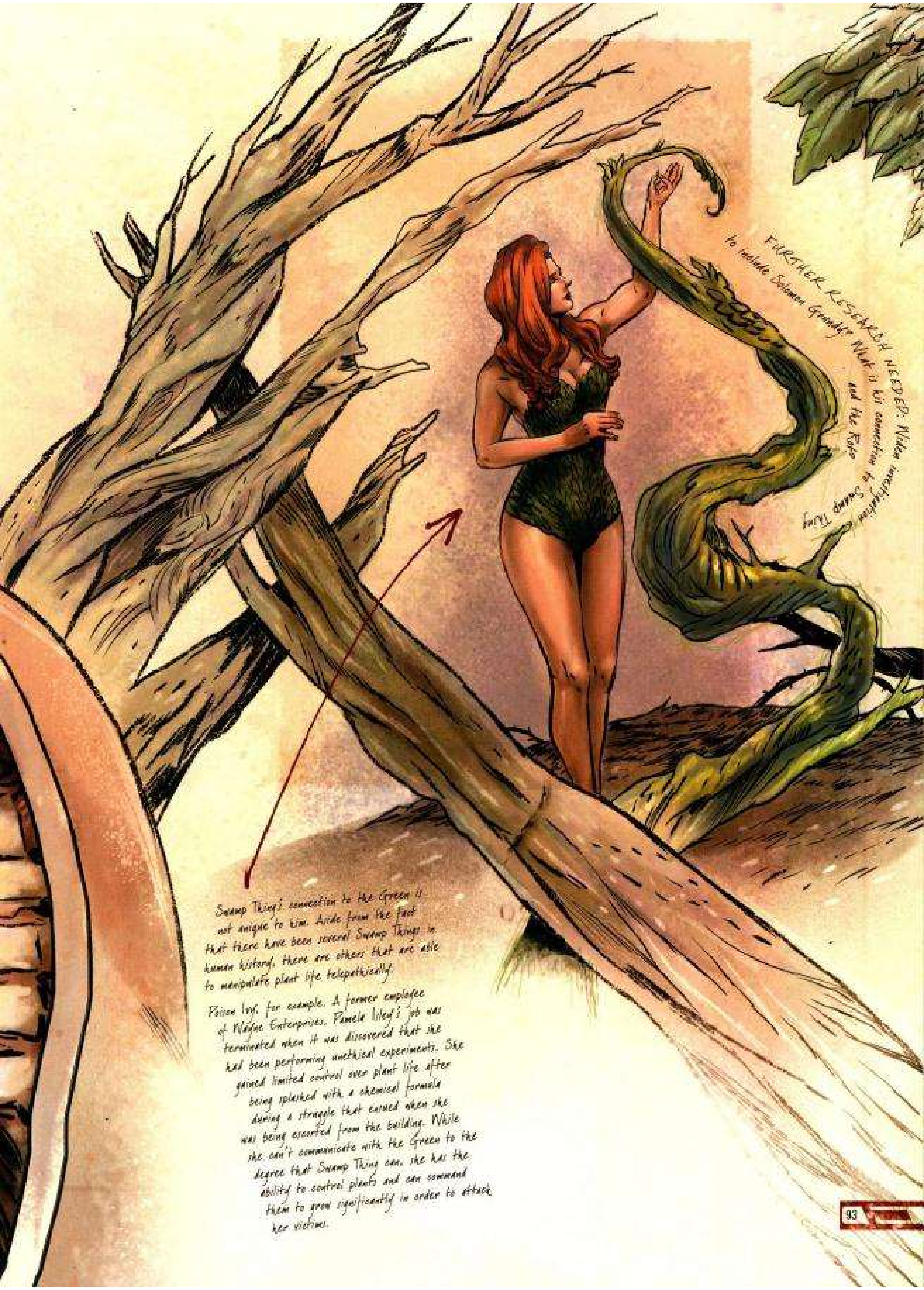


Though Swamp Thing maintains a humanoid frame, I have to wonder if any of the physicality of Dr. Holland remains underneath.

Clearly, his thoughts are still representative of Dr. Holland's, as he has memories of his human life, but are these memories stored in a human mind, or have they become part of the common consciousness that the Green shares?

Speculative thought experiment in which human organs are fused with plant elements, creating a hybrid physiology.

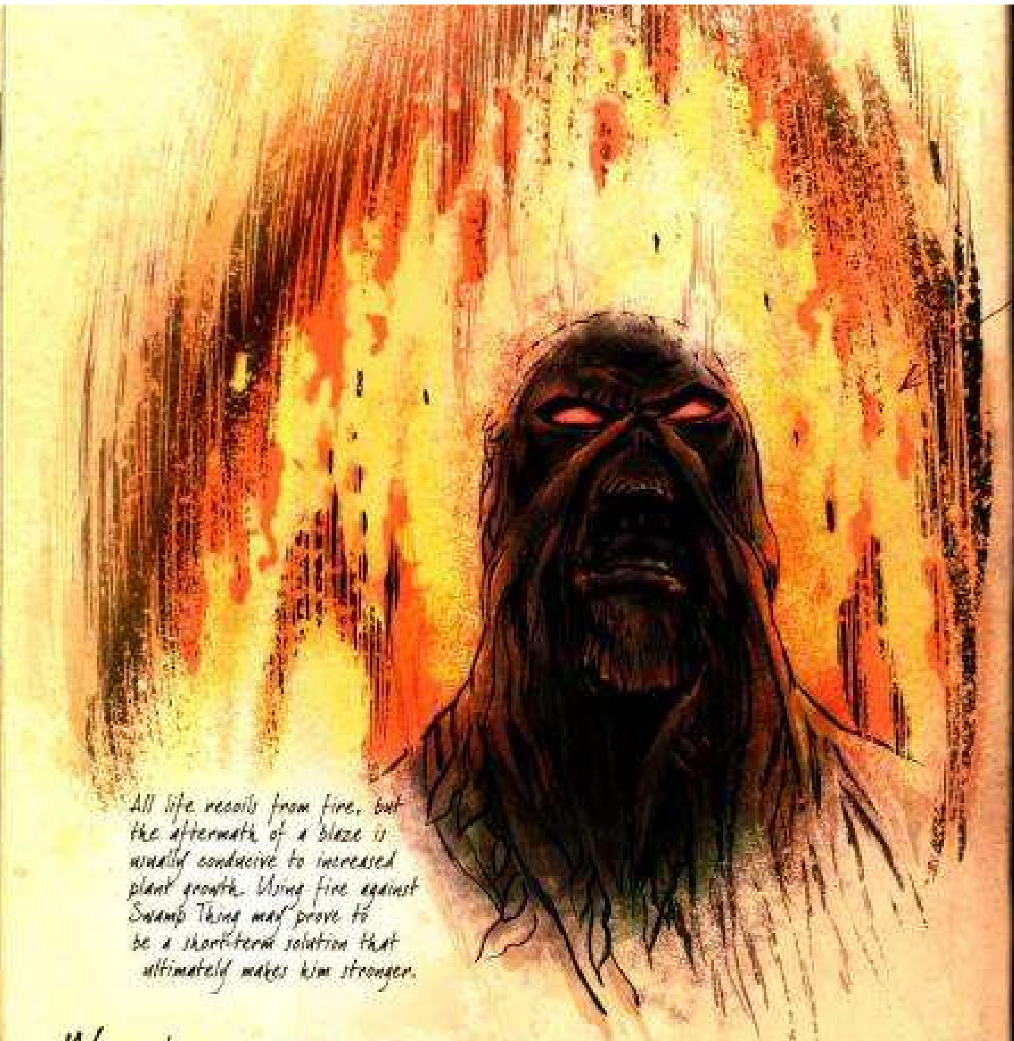
A heart that pumps chlorophyll? Too reductive to think in terms of human organs?



FURTHER RESEARCH NEEDED: Widen investigation to include Solomon Grundy? What is his connection to Swamp Thing and the Rot

Swamp Thing's connection to the Green is not unique to him. Aside from the fact that there have been several Swamp Things in human history, there are others that are able to manipulate plant life telepathically.

Poison Ivy, for example. A former employee of Wayne Enterprises, Pamela Isley's job was terminated when it was discovered that she had been performing unethical experiments. She gained limited control over plant life after being splashed with a chemical formula during a struggle that ensued when she was being escorted from the building. While she can't communicate with the Green to the degree that Swamp Thing can, she has the ability to control plants and can command them to grow significantly in order to attack her victims.



All life recoils from fire, but the aftermath of a blaze is usually conducive to increased plant growth. Using fire against Swamp Thing may prove to be a short-term solution that ultimately makes him stronger.

Weaknesses

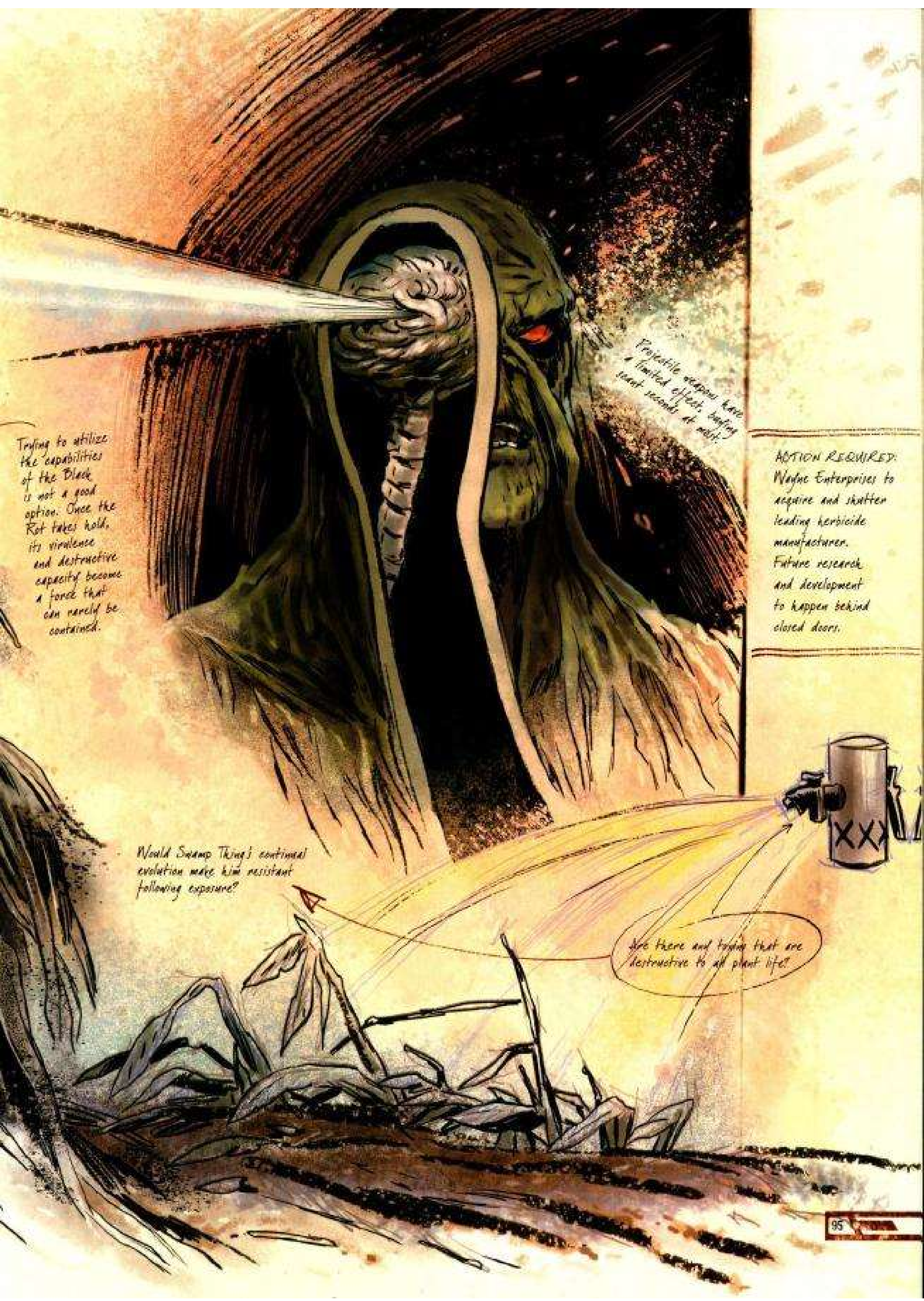
Like Aquaman, Swamp Thing needs proximity to his natural surroundings to use his abilities at full strength. Take him out of his element, and his powers are limited. He's also susceptible to fire and to the forces of the Rot. The Rot, or the Black, is the essence of death and decay and has challenged the other elemental forces for dominion more than once. It is a threat to all life if not kept in check.

Severe trauma can also take Swamp Thing out of a fight for a short period. It's been observed that a mid-caliber gunshot to the head will stun him for as long as a full minute. While I refuse to use lethal firearms for personal reasons, deploying a small incendiary device could buy time in a fight with Swamp Thing, making it possible to stage a counterattack.

If I could get my hands on a sample of Holland's bio-restorative compound, it might also be possible to synthesize a formula that would work as a neutralizing agent, cutting off Swamp Thing's regenerative capabilities--but that's assuming that the formula is what primarily sustains him, and not the Green. An herbicidal attack might distract him for a few minutes, but his constantly regenerating tissues would quickly evolve to create a chemical that would counteract such an offensive.

These are all just theories should we find ourselves in a worst-case scenario, however. Keep in mind that doing battle with any elemental Avatar should be a last resort. The forces of nature are bigger than us and should not be needlessly tampered with. Thankfully, whether it was fate or genetics that gave Alec Holland his connection to the Green, he has maintained his essential humanity. In the face of the seemingly limitless power Swamp Thing wields, his dedication to the service of life and balance on Earth is highly commendable.

I do not relish considering these potentially lethal methods of neutralization. They have a place in theoretical discussion and can form the basis for less extreme, nonlethal measures, but I will never embark on a course of action that may result in the death of an adversary.



Trying to utilize the capabilities of the Black is not a good option. Once the Rot takes hold, its virulence and destructive capacity become a force that can rarely be contained.

Projectile weapons have a limited effect, buying scant seconds at most.

ACTION REQUIRED:
Wayne Enterprises to acquire and shatter leading herbicide manufacturer. Future research and development to happen behind closed doors.

Would Swamp Thing's continual evolution make him resistant following exposure?

Are there any toxins that are destructive to all plant life?

DARKSEID

One of the most powerful beings humanity has ever encountered, Darkseid was the tyrannical ruler of a domain that lies outside of time and space as we currently understand it. Darkseid's primary power was the Omega Effect, which seems to be a kind of anticreation energy, a destructive, chaotic, enforced entropy. He could erase life, transmute matter, and create interdimensional tunnels with this power. His occasional violent forays into our territory were usually a means to expand his own kingdom and have cost thousands of innocent lives. During our last battle with Darkseid, he appeared to die at the hands of his equally corrupt daughter, Grail. But for a being of such immense power, death is often just a temporary setback.

The legend of Darkseid's origin is certainly mythic. It tells of Uxas, a simple farmer on an alien planet who was deeply dissatisfied with the so-called gods that ruled there. A brilliant schemer, Uxas went to the gods' mountain and tricked them into fighting one another. With the gods weakened by their battles, Uxas killed them one by one and stole their powers. From them, he gained immortality and near invulnerability, dominant physical strength and speed, and his deadly Omega Effect. Darkseid, as Uxas came to be known, began a lifelong quest for the Anti-Life Equation, seeking to conquer and dominate all life in the universe.

The New Gods

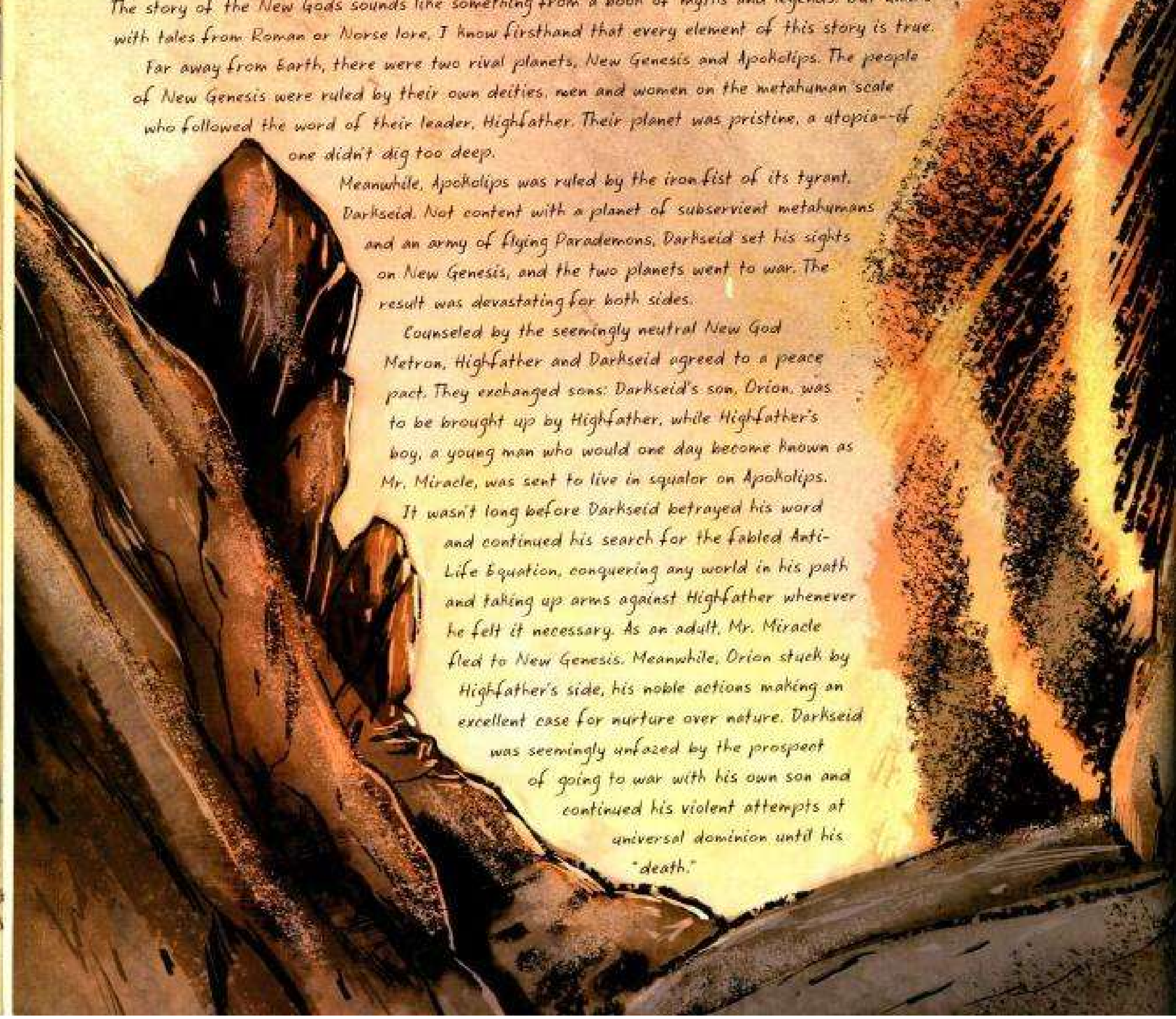
The story of the New Gods sounds like something from a book of myths and legends, but unlike with tales from Roman or Norse lore, I know firsthand that every element of this story is true.

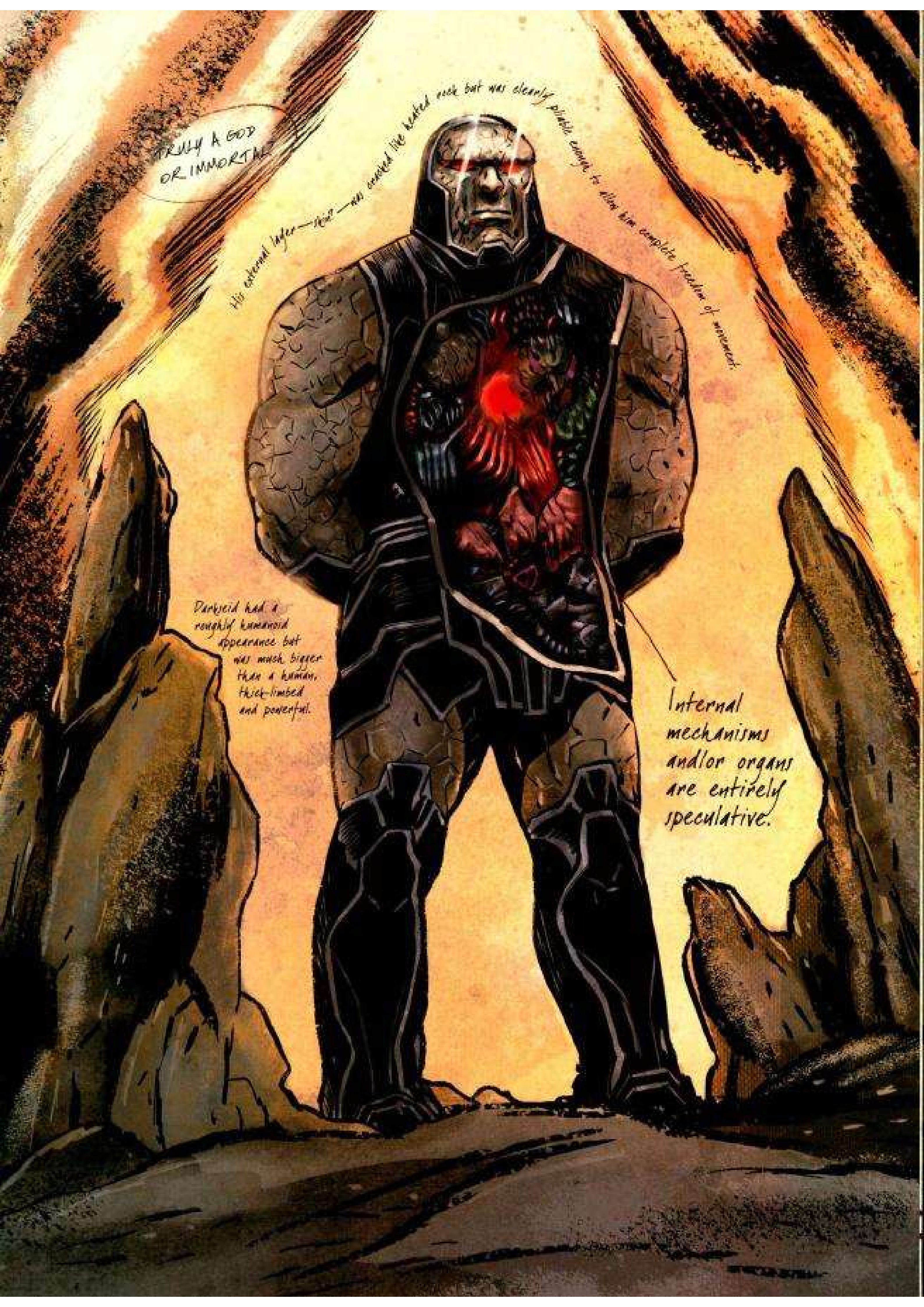
Far away from Earth, there were two rival planets, New Genesis and Apokolips. The people of New Genesis were ruled by their own deities, men and women on the metahuman scale who followed the word of their leader, Highfather. Their planet was pristine, a utopia--if one didn't dig too deep.

Meanwhile, Apokolips was ruled by the iron fist of its tyrant, Darkseid. Not content with a planet of subservient metahumans and an army of flying Parademons, Darkseid set his sights on New Genesis, and the two planets went to war. The result was devastating for both sides.

Counseled by the seemingly neutral New God Metron, Highfather and Darkseid agreed to a peace pact. They exchanged sons: Darkseid's son, Orion, was to be brought up by Highfather, while Highfather's boy, a young man who would one day become known as Mr. Miracle, was sent to live in squalor on Apokolips.

It wasn't long before Darkseid betrayed his word and continued his search for the fabled Anti-Life Equation, conquering any world in his path and taking up arms against Highfather whenever he felt it necessary. As an adult, Mr. Miracle fled to New Genesis. Meanwhile, Orion stuck by Highfather's side, his noble actions making an excellent case for nurture over nature. Darkseid was seemingly unfazed by the prospect of going to war with his own son and continued his violent attempts at universal dominion until his "death."




TRULY A GOD OR IMMORTAL

His external layer—skin?—was cracked like heated rock but was clearly pliable enough to allow him complete freedom of movement.

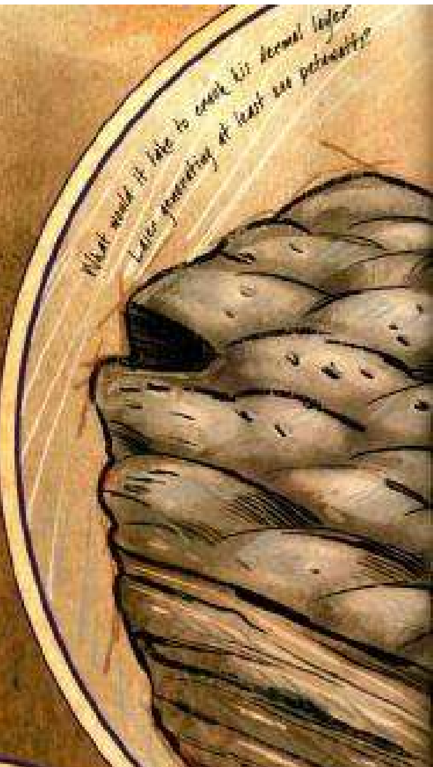
Darkseid had a roughly humanoid appearance but was much bigger than a human, thick-limbed and powerful.

Internal mechanisms and/or organs are entirely speculative.

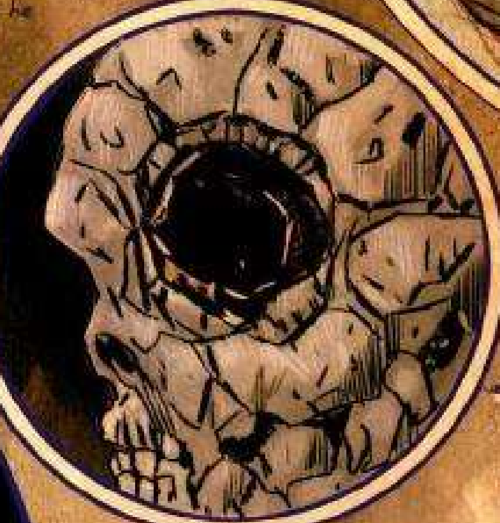
Alien Physiology

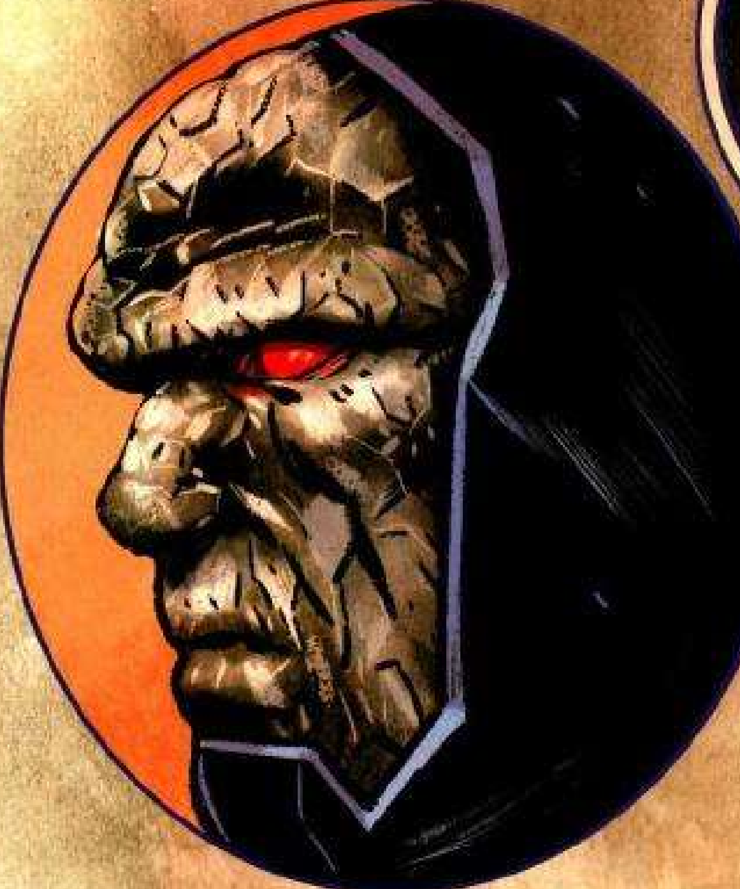
There is no data that suggest that Darkseid's physical makeup was comparable to human physiology. He was a giant by Earth's standards, nearly nine feet tall and heavily muscled. He had arms and legs and facial features, but beyond this basic morphology, he was distinctly nonhuman. Having no access to samples of his tissue or blood, I can't compare his musculature or central nervous system to a human's, or even a Kryptonian's. The best I can do is draw analogies to some of the metahuman traits I've discussed elsewhere in this book and share what data I've been able to theorize concerning his power source, the Omega Effect.

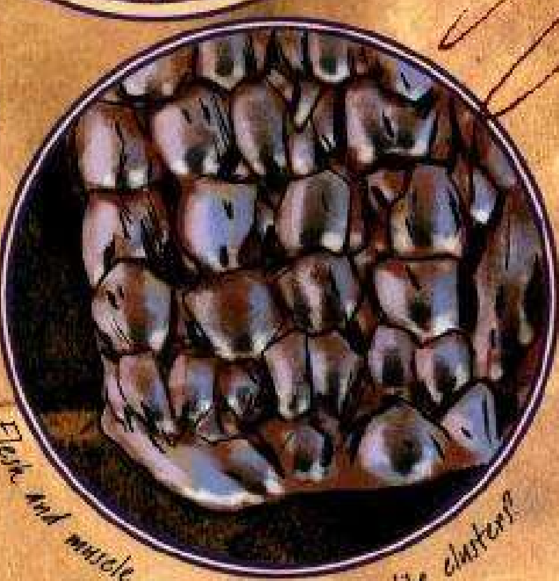
Darkseid was as physically strong as Superman and actually may have been stronger when fighting in short bursts: In collating the digital recordings of Superman's fight with Darkseid and my own encounter with the despot, I found that Darkseid reacted nanoseconds faster than Clark at several points and displayed much greater destructive power. The Omega Effect energy that he could emit as beams from his eyes seemed to fuel his punches and strikes, creating devastating blows of pure force. Darkseid was able to shift through dimensional holes that he could create at will using these Omega Beams. This New God was the reason the Justice League formed in the first place, when Earth was attacked by Darkseid's Parademon forces. It took our combined efforts just to send him back through a Boom Tube.



What would it take to crack his dermal layer? Laser generating at least [illegible] petawatts?



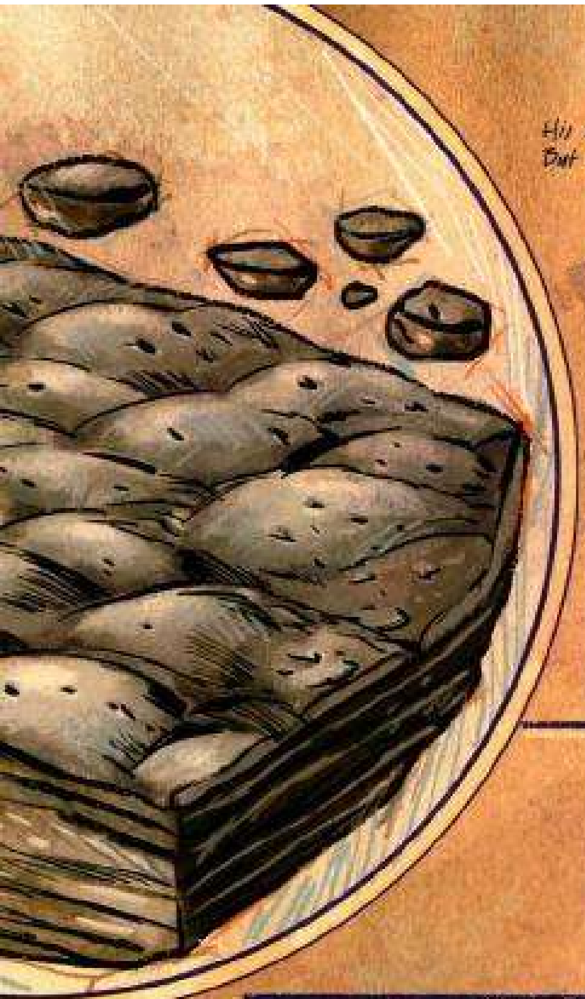


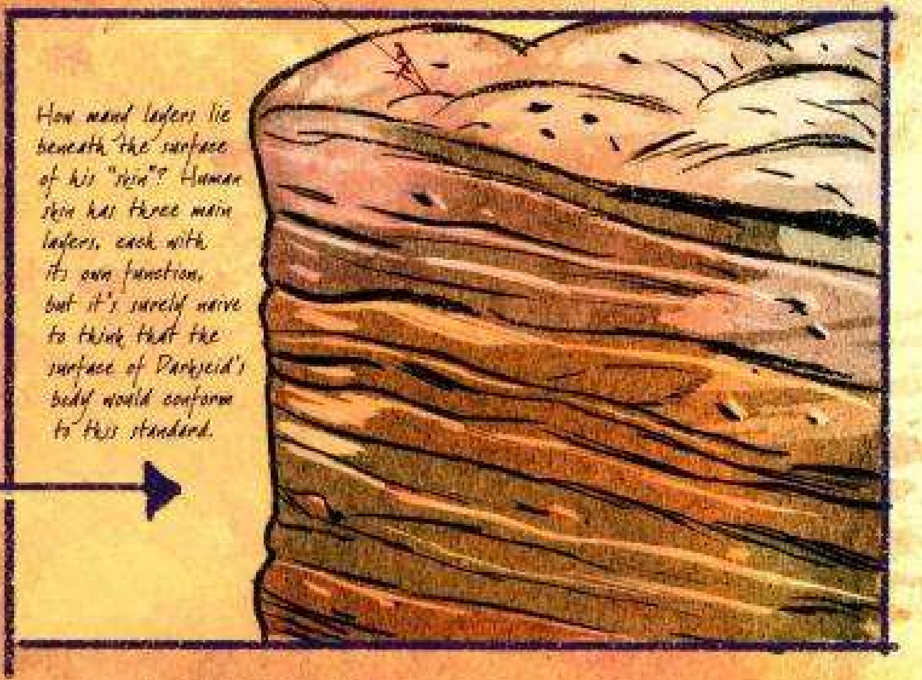


Flesh and muscle composed of granitelike clusters?

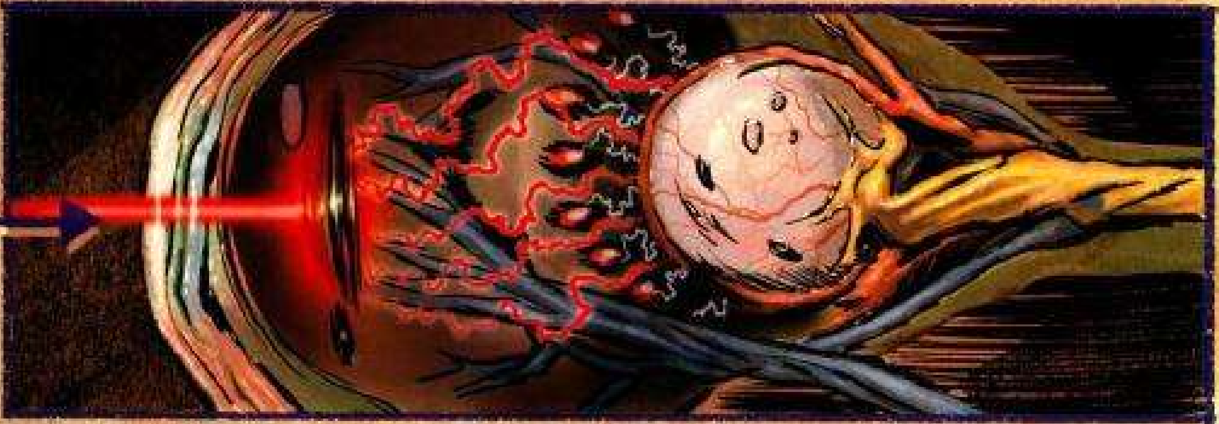
Though Darkseid was not human, it's reasonable to make a few comparisons. Like a human, he appeared to use his senses to gain information about events and his surroundings.

His dermal layer contained and protected that which was vital to his survival. But did his external features reflect internal processes similar to those of other metahumans?

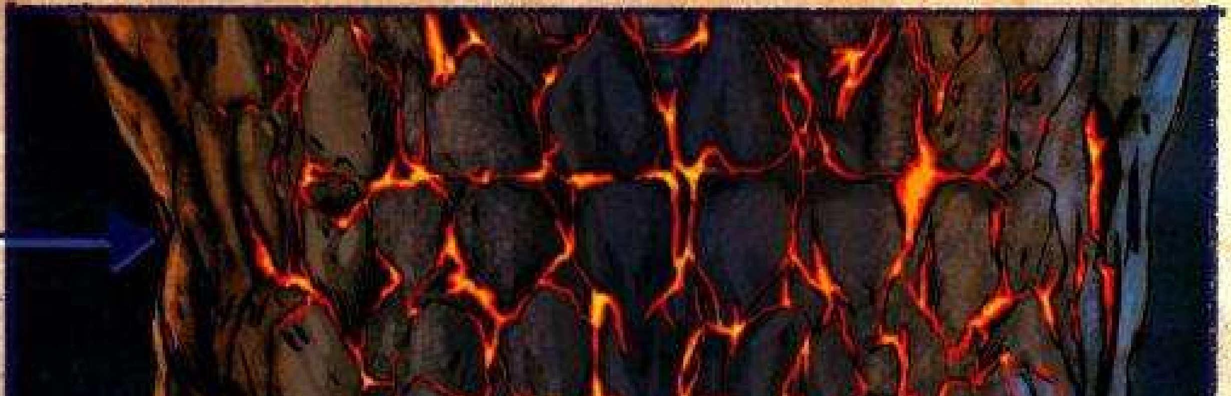




How many layers lie beneath the surface of his "skin"? Human skin has three main layers, each with its own function, but it's surely naive to think that the surface of Darkseid's body would conform to this standard.



envision the optic
organs that power
the Omega Beams as
compact thermonuclear
reactors. The blasts
channeled through the
lens of Darkseid's
eyes are powerful
enough to level a city
the size of Metropolis.



TION REQUIRED:
Vonder Woman's Bracelets
Submission have proven
be powerful enough to
thstand the blast of
rkseid's Omega Beams.
ust obtain Diana's
ermission to carry
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xamination of these
emyscira artifacts.

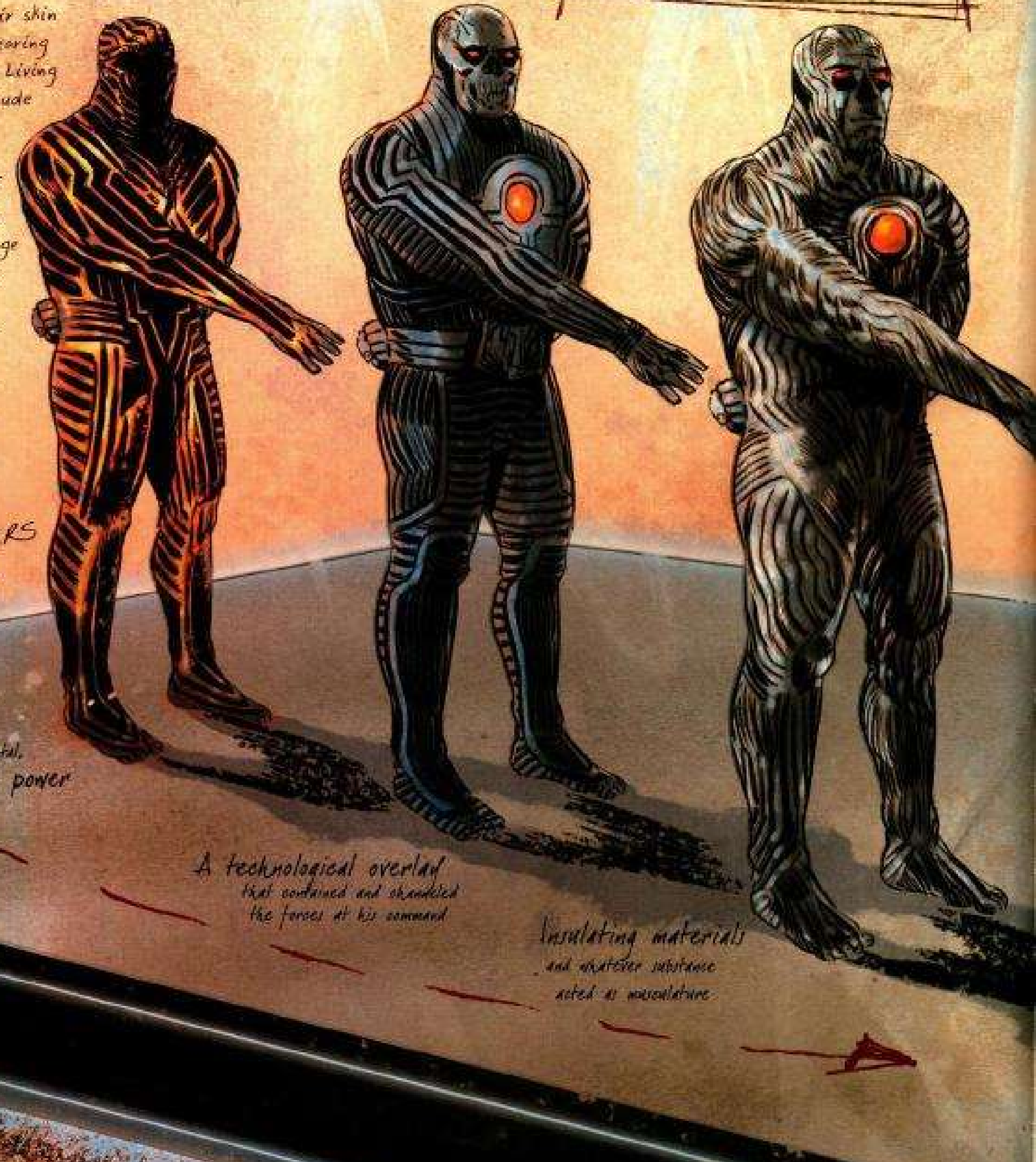
I'm unable to guess at the internal mechanisms that animated Darkseid, but it's possible they generated an intense heat beneath his rocky skin.

Darkseid's use of "boom tubes"--essentially wormholes that allow him to traverse space and time--requires additional research. Causing the devices to malfunction might be a way to trap him in a distant dimension.

Apokolips

Darkseid was the absolute ruler of Apokolips, a literal version of our mythical concept of "hell on Earth." He ruled his kingdom through fear and violence, the downtrodden masses overseen by giant, winged Parademons and a council of Female Furies. Apokolips is a much larger world than Earth, surfaced by an ecumenopolis (a planet-wide city), an endless technological wasteland broken up by burning fire pits. The denizens of this world must have a much denser musculature than that found in humans, their skin resistant to searing temperatures. Living lives of servitude without hope of liberation, the people of Apokolips are a brutal, savage race, the few exceptions hiding in the shadows of the planet's infamous ghettos.

Even if there were extradimensional forms of Darkseid that we couldn't access, seeking ways to bar his manifestation's entry to our world might prove useful for restricting others like him from reaching us.



POSSIBLE LAYERS OF DARKSEID:

The fundamental, **elemental power** at his core

A technological overlay that contained and channeled the forces at his command

Insulating materials and whatever substance acted as musculature

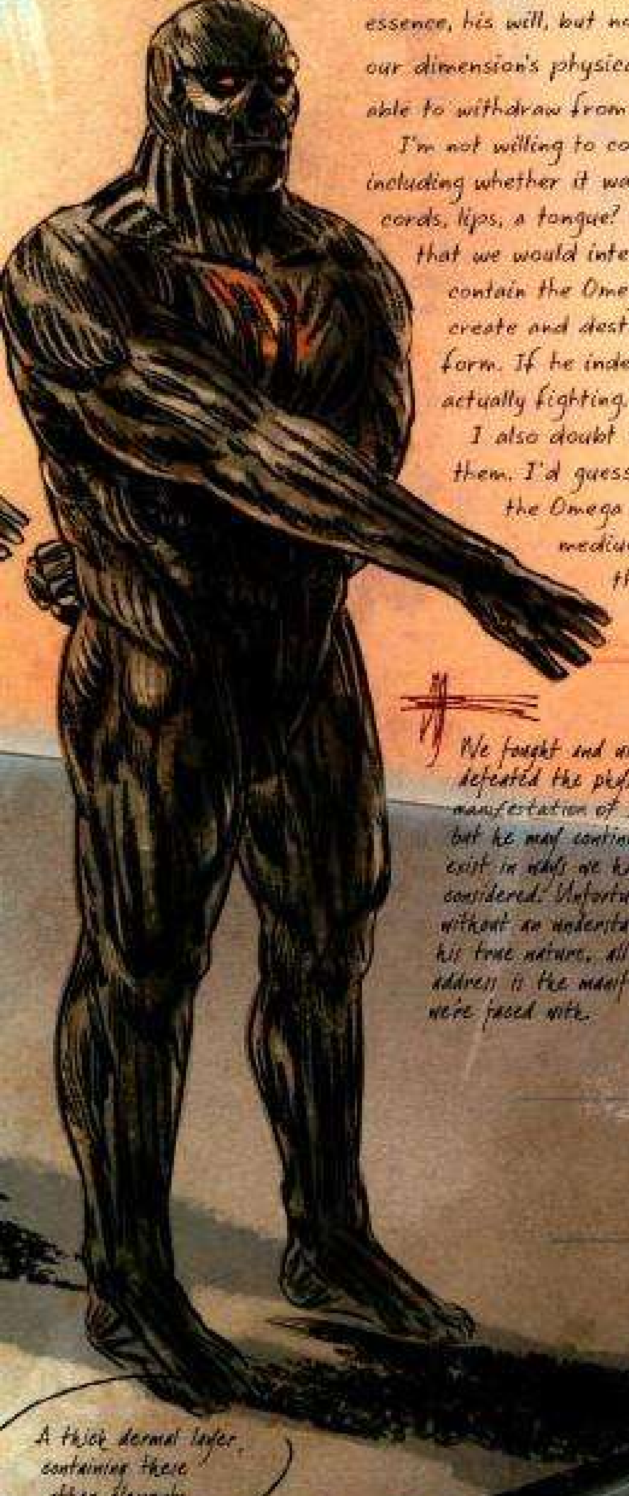
Physical Makeup

Darkseid appeared roughly humanoid in form, but there were some obvious differences. His eyes glowed red. His skull-like face appeared hewn from veined stone, as did the visible portions of "skin" beneath his armor. I say "armor," but given the levels of technology available to Darkseid, the metallic plating may have also served as an environmental suit, an additional source of power, or some other purpose that we don't yet understand.

I have a theory that Darkseid is a multidimensional creature, and we may only be battling a physical shell in the third dimension here on Earth--his suit of armor and flesh containing his essence, his will, but not the entirety of his being. Darkseid's physical body would be subject to our dimension's physical laws, but he may have existed in other forms unaffected by our actions, able to withdraw from our perception at will.

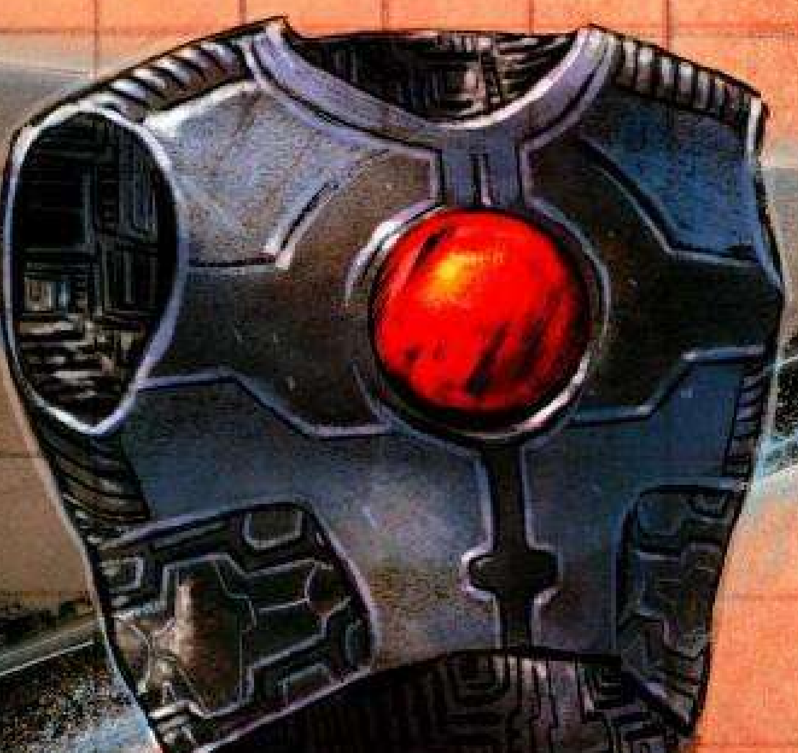
I'm not willing to commit to any assumptions about Darkseid's actual physical form, however, including whether it was supported by a skeletal system. He spoke but does that necessitate vocal cords, lips, a tongue? He had eyes, but does that mean he "saw" and interpreted data in a manner that we would interpret as vision? However his body was constructed, it had to be able to contain the Omega Effect, an energy powerful enough to transform matter, which could create and destroy worlds. It goes without saying that he was fully capable of choosing his form. If he indeed one day returns, we shouldn't assume that the form we see is what we're actually fighting.

I also doubt that Darkseid had internal organs, at least in the way we understand them. I'd guess his torso housed complex battery-like storage devices that supported the Omega Effect. Maybe his internal cavities were filled with an energy-enhancement medium, or particles that drew the Omega Effect. This is clearly speculation, though, and included here just as food for thought.

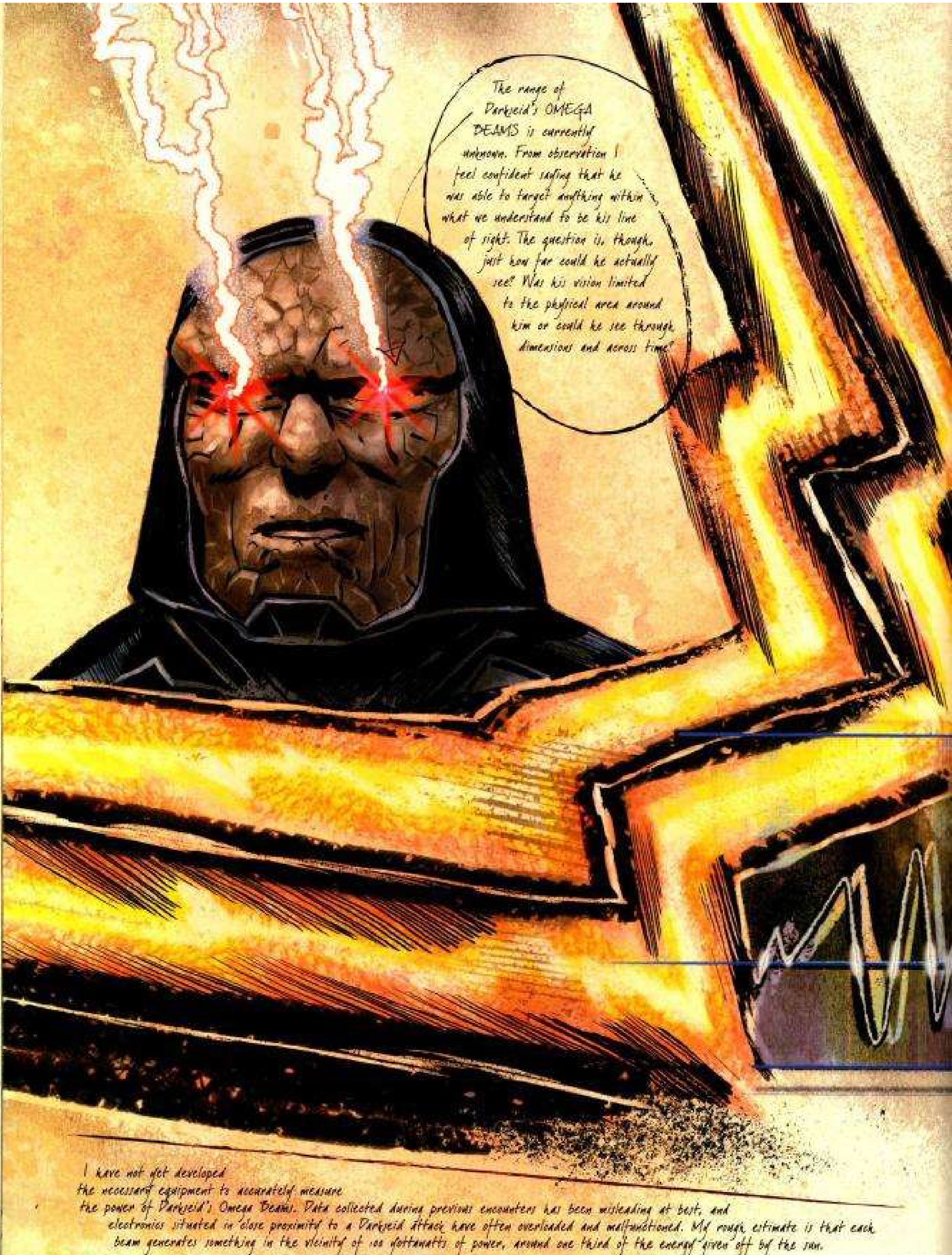


We fought and ultimately defeated the physical manifestation of Darkseid, but he may continue to exist in ways we haven't considered. Unfortunately, without an understanding of his true nature, all we can address is the manifestation we're faced with.

A thick dermal layer, containing these other elements



An environmental suit or additional protection for his core? Could it have served as a power source?



The range of Darkseid's OMEGA BEAMS is currently unknown. From observation I feel confident saying that he was able to target anything within what we understand to be his line of sight. The question is, though, just how far could he actually see? Was his vision limited to the physical area around him or could he see through dimensions and across time?

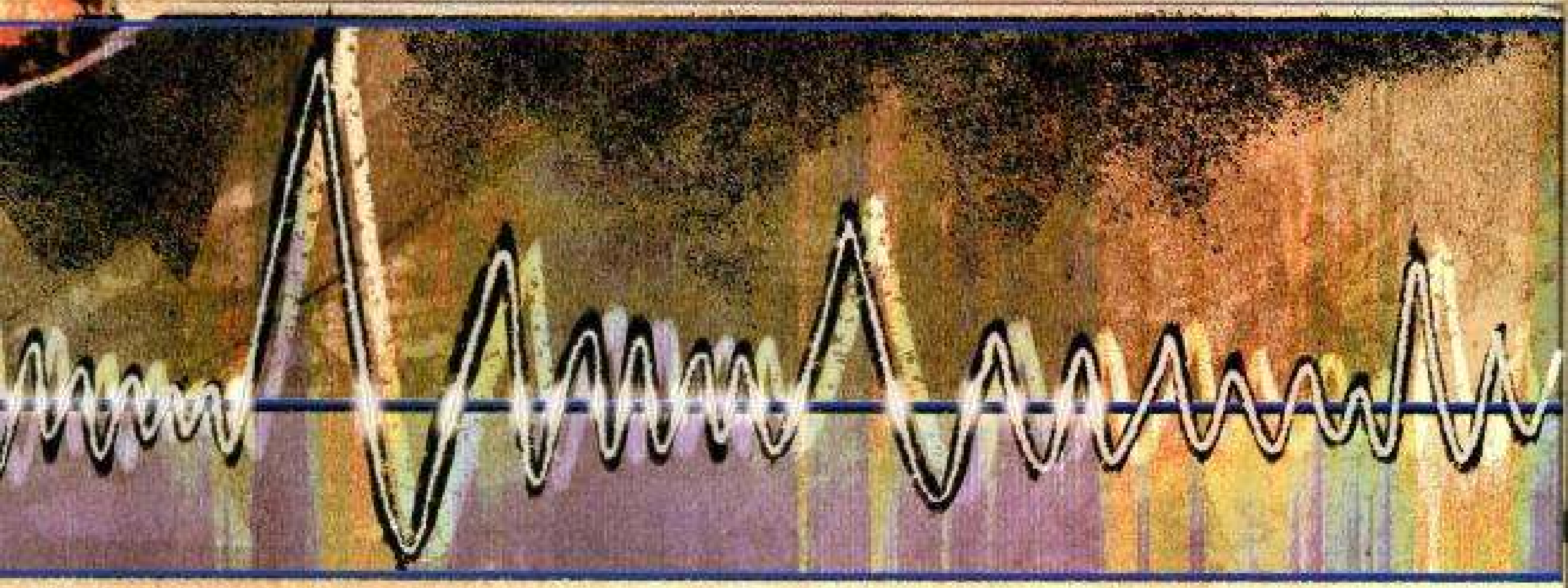
I have not yet developed the necessary equipment to accurately measure the power of Darkseid's Omega Beams. Data collected during previous encounters has been misleading at best, and electronics situated in close proximity to a Darkseid attack have often overloaded and malfunctioned. My rough estimate is that each beam generates something in the vicinity of 100 yottawatts of power, around one third of the energy given off by the sun.

String theory holds that matter at its most basic level is a confluence of harmonics.

Omega Effect

We know little about the people of Darkseid's original planet. We do know that they were alien beings with physiologies quite different from those of an average human, and that their gods possessed powers on the metahuman scale. In absorbing the abilities of these gods, Darkseid gained access to the Omega Effect, the apparent source of his god-power. As a result, he could project Omega Beams--destructive rays of incredible power--from his body. Is it possible that these beams were directed waves of the harmonics that hold matter together? Darkseid could break force fields and vibrate barriers apart. If he were capable of manipulating the very force that holds the particles of atoms together, he could have easily destroyed anything in his path by vibrating the harmonics in specific patterns. It's not the strongest theory--and is based almost solely on observing the effects of his power--but the absolute obliteration of matter hints at subatomic interference.

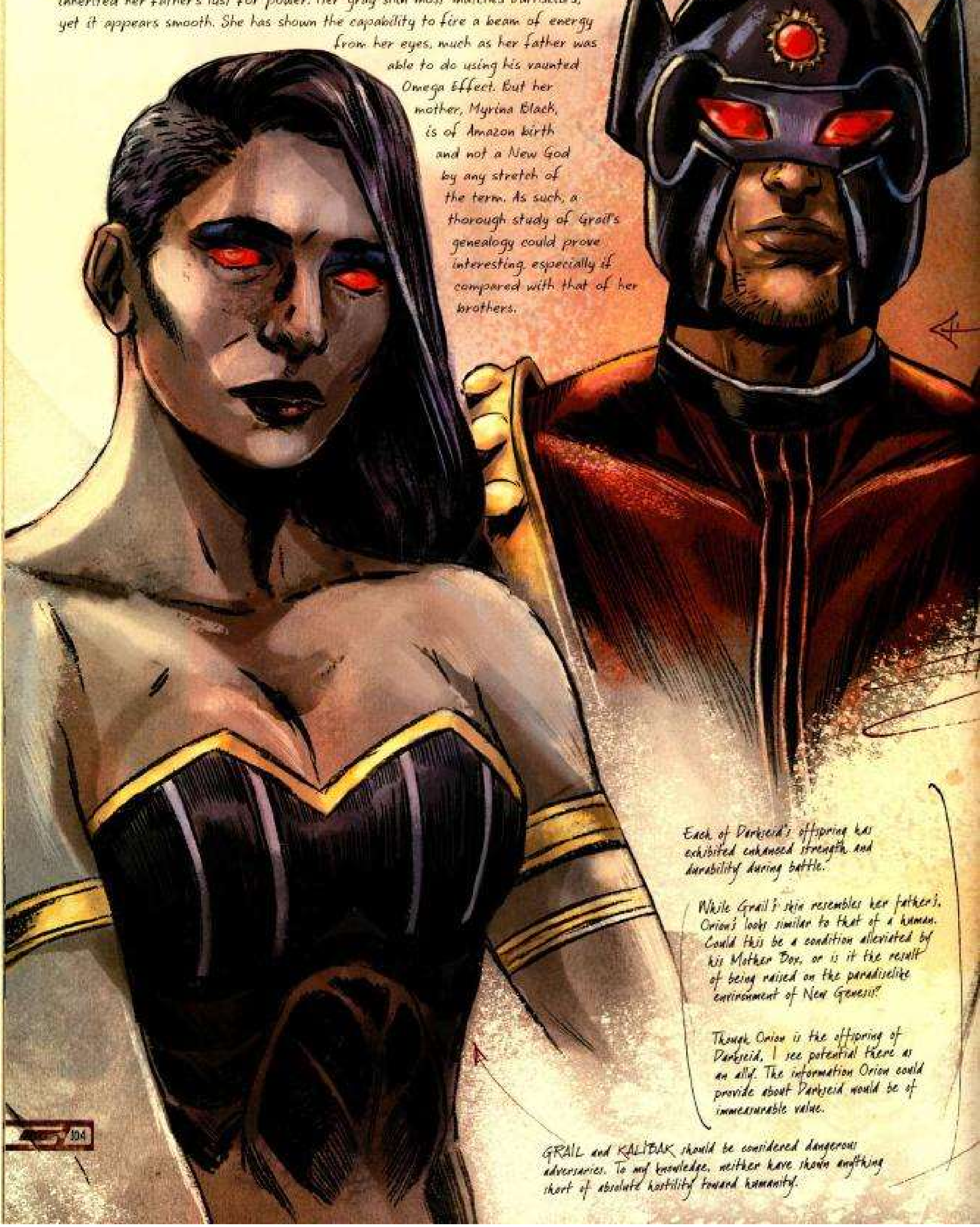
Does the Omega Effect disrupt these balances? The sheer destructive force of Darkseid's Omega Effect certainly suggests a fundamental, elemental disruption in matter.



Fire and electricity are harnessed parts of our dimension but not technically matter, rather, they are events. Can the Omega Beams disrupt these events as easily as they disrupt physical matter?

Offspring

One of the most puzzling factors in Darkseid's genetic makeup is how different his children are both from him and each other. His daughter, Grail, seems to have inherited her father's lust for power. Her gray skin most matches Darkseid's, yet it appears smooth. She has shown the capability to fire a beam of energy from her eyes, much as her father was able to do using his vaunted Omega Effect. But her mother, Myrina Black, is of Amazon birth and not a New God by any stretch of the term. As such, a thorough study of Grail's genealogy could prove interesting, especially if compared with that of her brothers.



Each of Darkseid's offspring has exhibited enhanced strength and durability during battle.

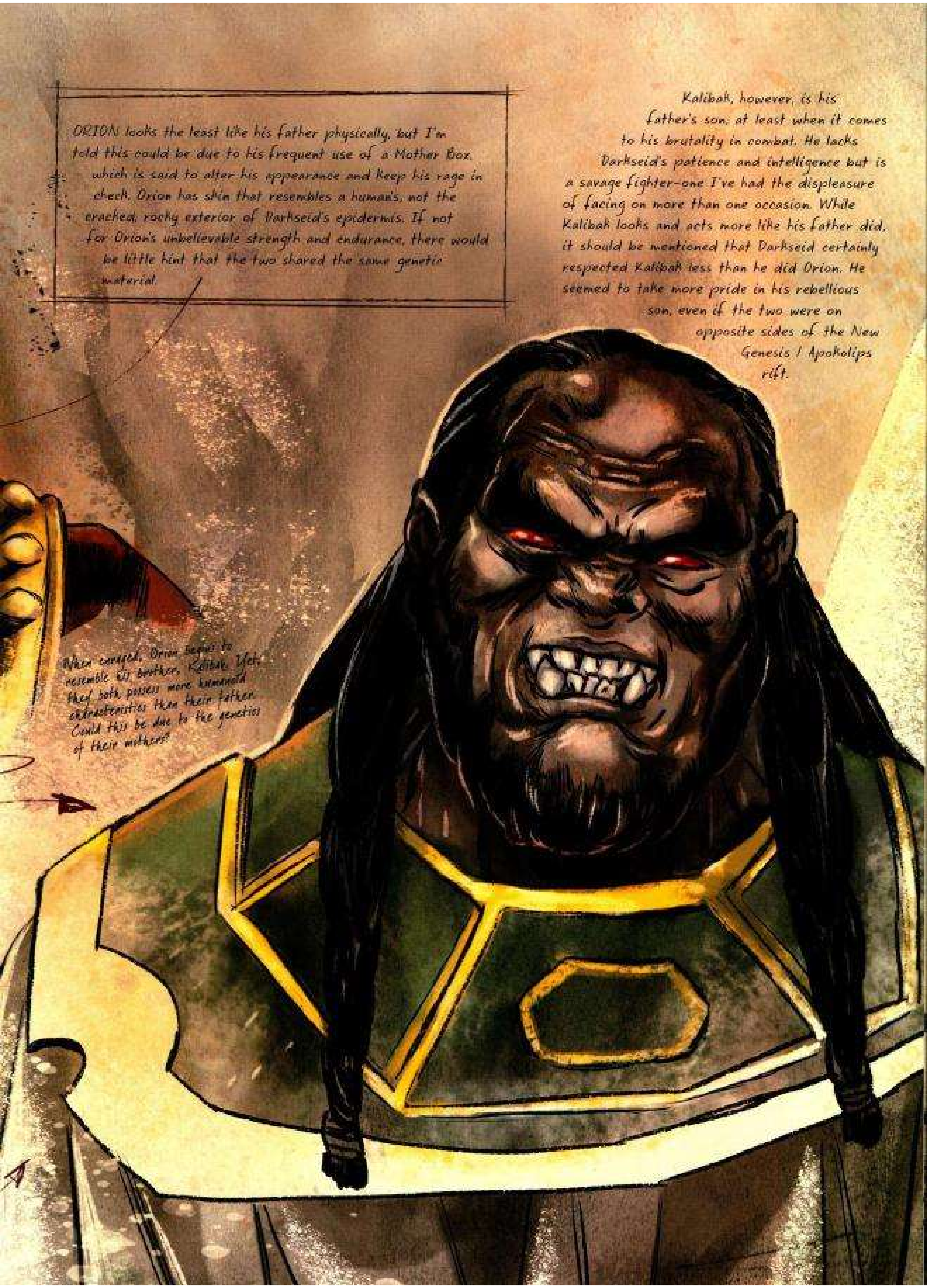
While Grail's skin resembles her father's, Orion's looks similar to that of a human. Could this be a condition alleviated by his Mother Box, or is it the result of being raised on the paradiselike environment of New Genesis?

Though Orion is the offspring of Darkseid, I see potential there as an ally. The information Orion could provide about Darkseid would be of immeasurable value.

GRAIL and KALIBAK should be considered dangerous adversaries. To my knowledge, neither have shown anything short of absolute hostility toward humanity.

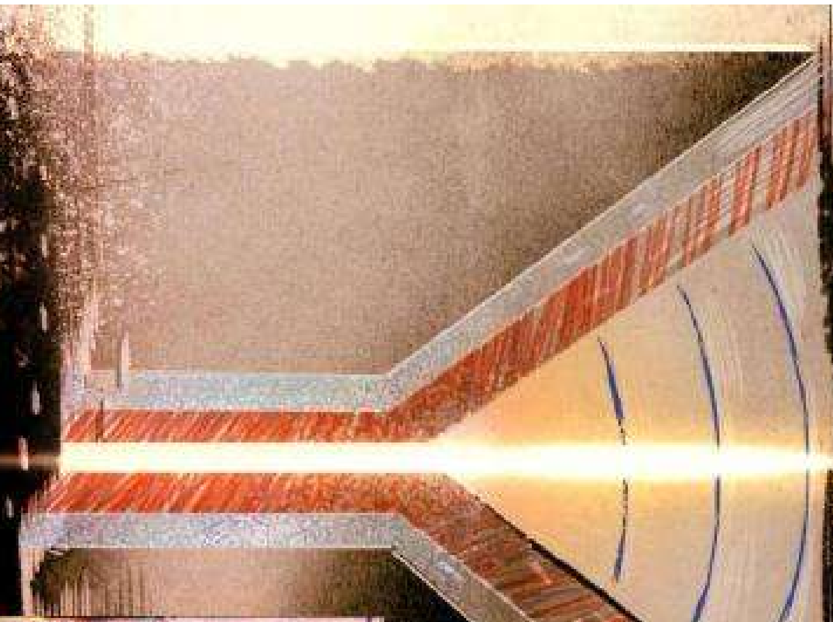
ORION looks the least like his father physically, but I'm told this could be due to his frequent use of a Mother Box, which is said to alter his appearance and keep his rage in check. Orion has skin that resembles a human's, not the cracked, rocky exterior of Darkseid's epidermis. If not for Orion's unbelievable strength and endurance, there would be little hint that the two shared the same genetic material.

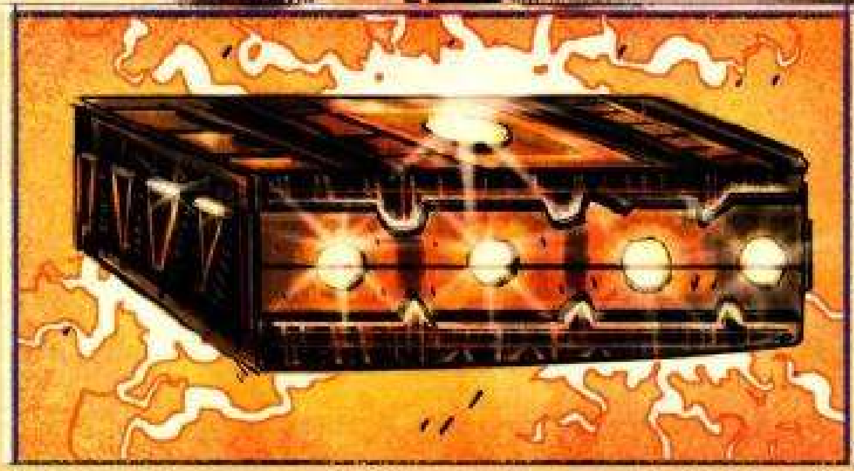
Kalibak, however, is his father's son, at least when it comes to his brutality in combat. He lacks Darkseid's patience and intelligence but is a savage fighter—one I've had the displeasure of facing on more than one occasion. While Kalibak looks and acts more like his father did, it should be mentioned that Darkseid certainly respected Kalibak less than he did Orion. He seemed to take more pride in his rebellious son, even if the two were on opposite sides of the New Genesis / Apokolips rift.



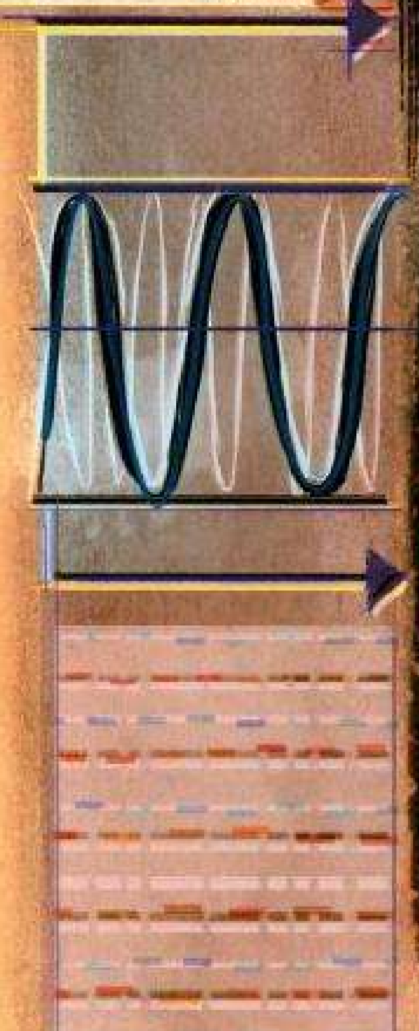
When enraged, Orion begins to resemble his brother, Kalibak. Yet, they both possess more humanoid characteristics than their father. Could this be due to the genetics of their mothers?

More effort needs to be geared toward gaining additional information about the Mother Box.





Are there different versions of the box? Are they sentient without bias, regardless of use? Can its capabilities be used against its host?



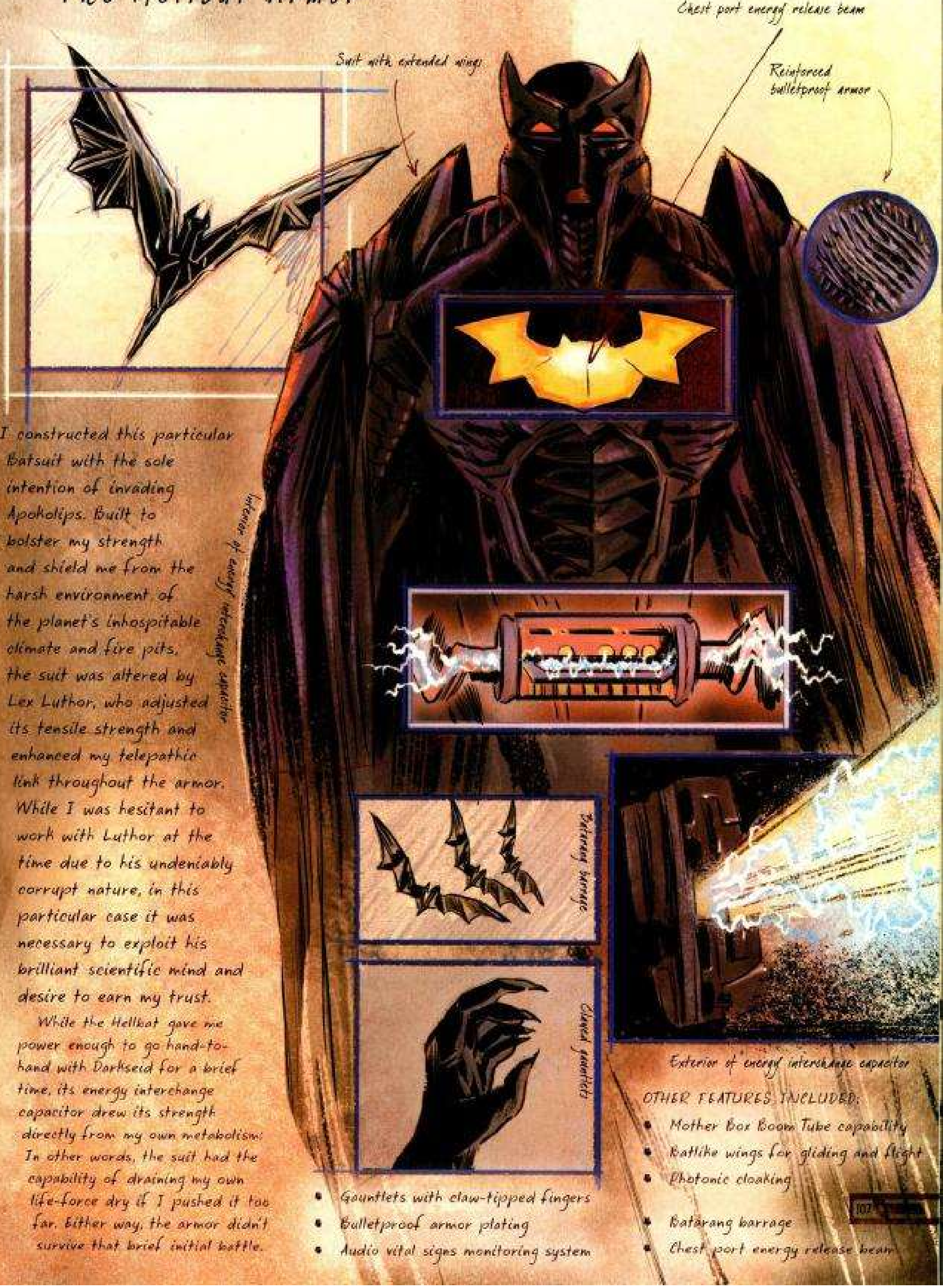
Weaknesses

If Darkseid should return, the key to stopping him in future conflicts lies in researching his technology. Cyborg's Mother Box came from Darkseid's realm. Convincing Victor that we need to unravel Darkseid's mechanism of power might be a way for us to study both of these technologically advanced beings. At least observations of Cyborg's Mother Box functions reveal a base level to work with, a solid starting point for practical extrapolations. I also recommend more research into sonic and harmonic manipulation. Even if my theory about the Omega Effect doesn't pan out, resonance weapons may work well against a multidimensional being.

Darkseid was an ongoing threat, and in my opinion, should still be treated as one. Due to his likely return, having some specifically variable attack plans in place would be beneficial. Superman may not be available the next time Darkseid decides to drop in for a visit, and the last thing we need is to be caught underprepared.

Besides having access to a Mother Box, Cyborg's ability to replicate technology could be extremely helpful. If he can replicate any aspect of Darkseid's weaponry, we may stand a better chance of producing effective countermeasures against a new Darkseid or similar entities.

The Hellbat Armor


Suit with extended wings
Chest port energy release beam
Reinforced bulletproof armor
Interior of energy interchange capacitor
Batarang barrage
Clawed gauntlets
Exterior of energy interchange capacitor

I constructed this particular Batsuit with the sole intention of invading Apokolips. Built to bolster my strength and shield me from the harsh environment of the planet's inhospitable climate and fire pits, the suit was altered by Lex Luthor, who adjusted its tensile strength and enhanced my telepathic link throughout the armor. While I was hesitant to work with Luthor at the time due to his undeniably corrupt nature, in this particular case it was necessary to exploit his brilliant scientific mind and desire to earn my trust.

While the Hellbat gave me power enough to go hand-to-hand with Darkseid for a brief time, its energy interchange capacitor drew its strength directly from my own metabolism: In other words, the suit had the capability of draining my own life-force dry if I pushed it too far. Either way, the armor didn't survive that brief initial battle.

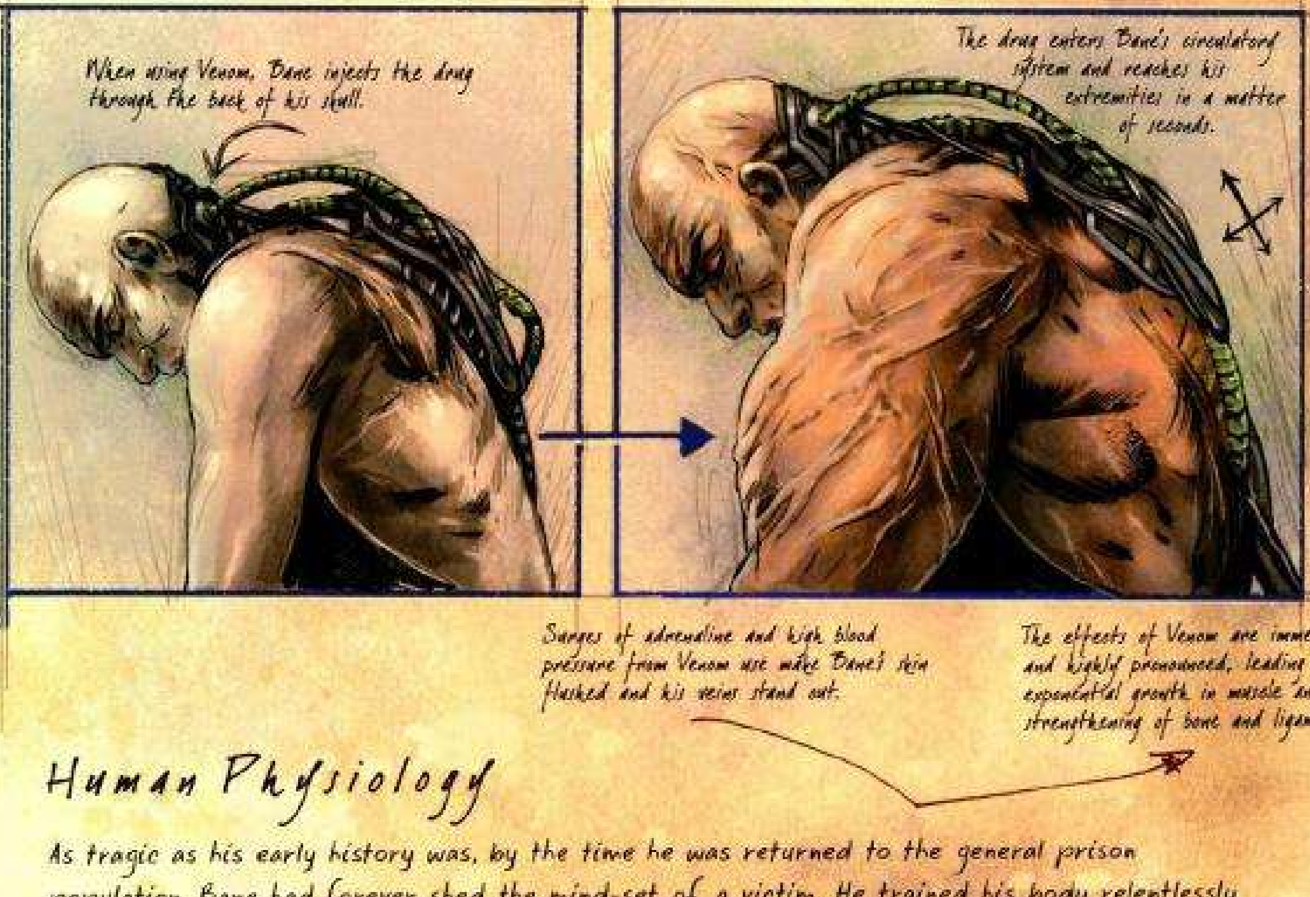
OTHER FEATURES INCLUDED:

- Mother Box Boom Tube capability
- Batlike wings for gliding and flight
- Photonic cloaking
- Gauntlets with claw-tipped fingers
- Bulletproof armor plating
- Audio vital signs monitoring system
- Batarang barrage
- Chest port energy release beam

Although he's not strictly a metahuman, I believe Bane's Venom-fuelled abilities make him just as much of a threat to society as some of the other subjects included in this study and therefore fully worthy of inclusion.

BANE

Some years ago on the corrupt Caribbean island nation of Santa Prisca, the young boy now known only as Bane was court-ordered to serve his father's life sentence in a violent maximum-security prison, following the older man's escape. Reports vary on how old he was the day he went in--some even believe he was born in the penitentiary--but we know his mother died when he was only six and Bane committed his first murder, the killing of a fellow inmate, soon after. He was put in solitary confinement for an extended period, locked in a dark, vermin-ridden hole that flooded at night. How he managed to survive his horrific environment quickly became the stuff of legend within the walls of Peña Duro.



When using Venom, Bane injects the drug through the back of his skull.

The drug enters Bane's circulatory system and reaches his extremities in a matter of seconds.

Surges of adrenaline and high blood pressure from Venom use make Bane's skin flushed and his veins stand out.

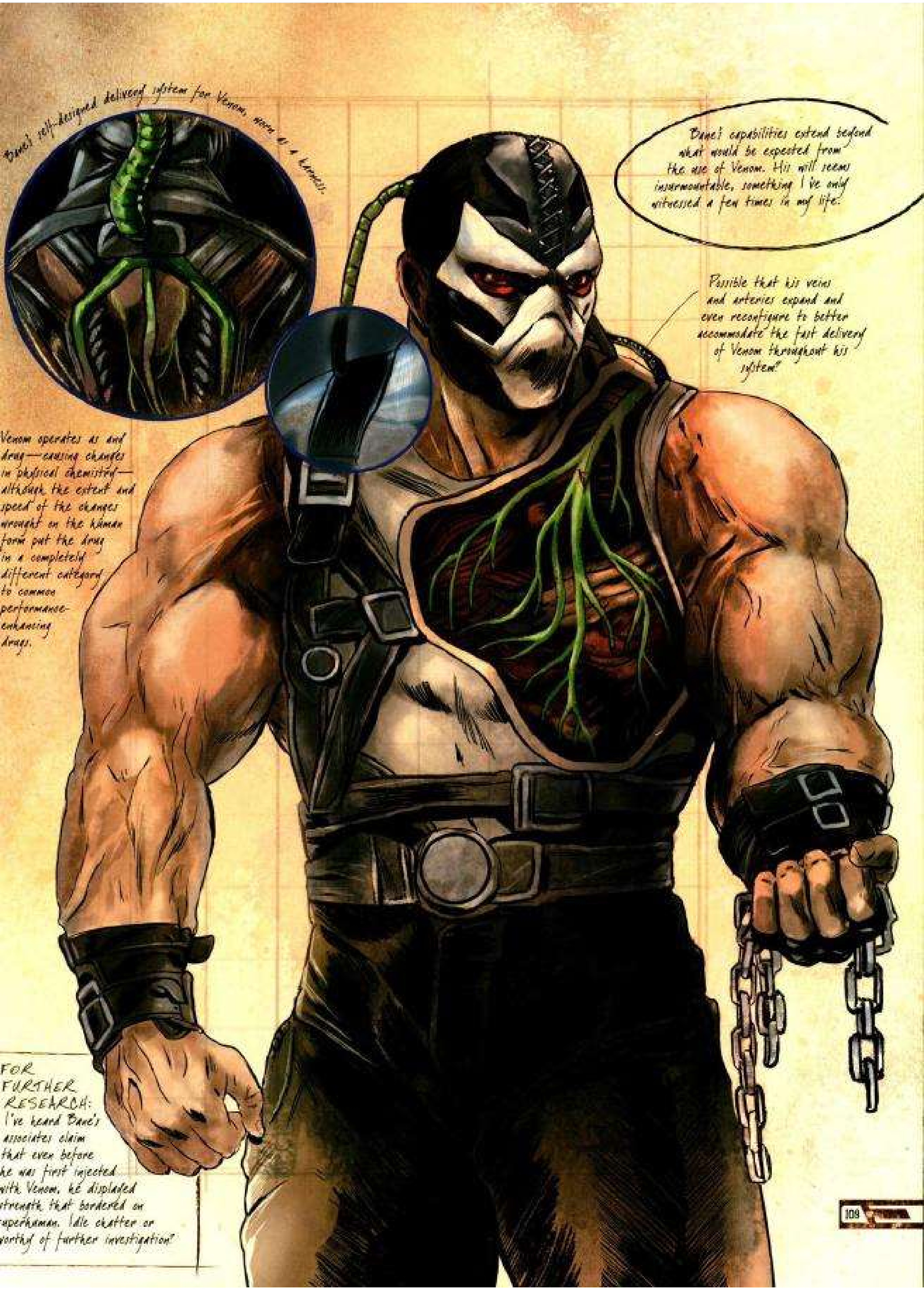
The effects of Venom are immediate and highly pronounced, leading to an exponential growth in muscle and the strengthening of bone and ligament.

Human Physiology

As tragic as his early history was, by the time he was returned to the general prison population, Bane had forever shed the mind-set of a victim. He trained his body relentlessly and read every book he could get his hands on. Standing well over six feet and weighing in at around 350 pounds, the self-educated and physically formidable Bane became an accomplished strategist and tactician and quickly rose to the top of the violent prison's criminal hierarchy.

When the prison's warden decided that Bane had become too powerful, he added medical experimentation to Bane's punishments, forcing him to be treated with a potentially fatal hyper-steroid cocktail known as Venom. Instead of killing Bane, the Venom enhanced him physically and mentally, creating a man far beyond human--a man fully primed for escape.

NOTE: Bane was defeated in combat by Azrael. Studying the vigilante's tactics may further reveal Bane's physical vulnerabilities.



Bane's self-designed delivery system for Venom, worn as a harness.

Bane's capabilities extend beyond what would be expected from the use of Venom. His will seems insurmountable, something I've only witnessed a few times in my life.

Possible that his veins and arteries expand and even reconfigure to better accommodate the fast delivery of Venom throughout his system?

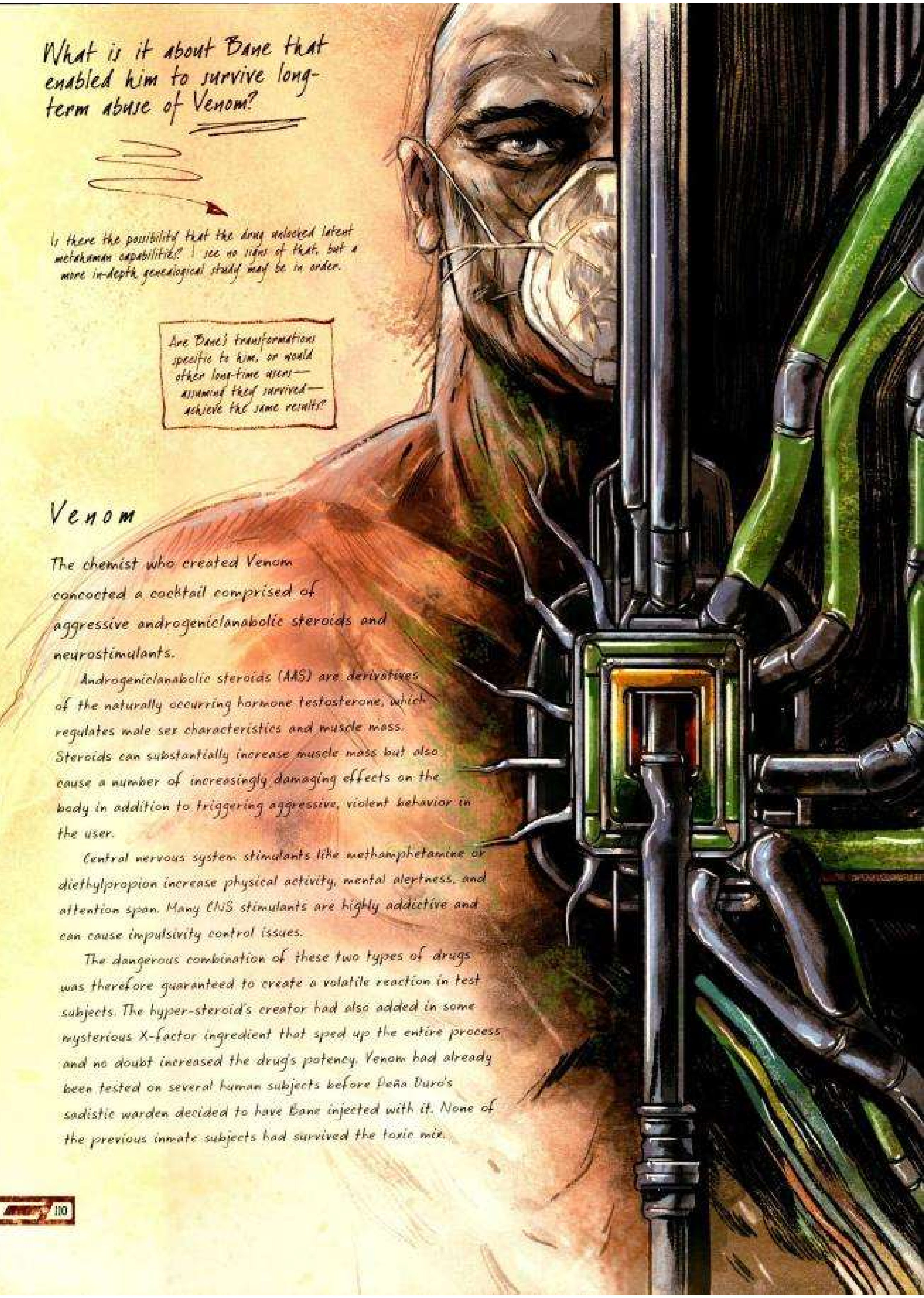
Venom operates as any drug—causing changes in physical chemistry—although the extent and speed of the changes wrought on the human form put the drug in a completely different category to common performance-enhancing drugs.

FOR FURTHER RESEARCH: I've heard Bane's associates claim that even before he was first injected with Venom, he displayed strength that bordered on superhuman. Idle chatter or worthy of further investigation?

What is it about Bane that enabled him to survive long-term abuse of Venom?

Is there the possibility that the drug unlocked latent metahuman capabilities? I see no signs of that, but a more in-depth genealogical study may be in order.

Are Bane's transformations specific to him, or would other long-time users—assuming they survived—achieve the same results?



Venom

The chemist who created Venom concocted a cocktail comprised of aggressive androgenic/anabolic steroids and neurostimulants.

Androgenic/anabolic steroids (AAS) are derivatives of the naturally occurring hormone testosterone, which regulates male sex characteristics and muscle mass. Steroids can substantially increase muscle mass but also cause a number of increasingly damaging effects on the body in addition to triggering aggressive, violent behavior in the user.

Central nervous system stimulants like methamphetamine or diethylpropion increase physical activity, mental alertness, and attention span. Many CNS stimulants are highly addictive and can cause impulsivity control issues.

The dangerous combination of these two types of drugs was therefore guaranteed to create a volatile reaction in test subjects. The hyper-steroid's creator had also added in some mysterious X-factor ingredient that sped up the entire process and no doubt increased the drug's potency. Venom had already been tested on several human subjects before Peña Duro's sadistic warden decided to have Bane injected with it. None of the previous inmate subjects had survived the toxic mix.

Peña Duro

Peña Duro
Medical Facility
Floor 3
Venom Experiment – Subject #6

5/2 3:37 AM
Subject prepped for surgery. Head shaved, neck cleaned for injection system.

5/2 3:43 AM
Inhalation anesthetic applied. Subject struggled for approximately two and a half minutes longer than average.

5/2 3:48 AM
Inhalation anesthetic reapplied. Subject first to wake from initial anesthesia. Broke both arm restraints. Was carried to a new operating table and secured again.

5/2 3:54 AM
Anesthesia seems inadequate. Subject remains conscious. Procedure momentarily halted while restraints doubled.

5/2 4:23 AM
Venom injection initiated. Subject still conscious.

5/3 3:28 AM
Subject remains stable. Second Venom injection initiated. No anesthesia applied.

5/4 4:34 AM
Vital signs remain stable. Third Venom injection initiated. Effect seems less painful for subject.

5/5 3:23 AM
Vital signs remain stable. Injections seem to be a success. Subject is first survivor of this stage/dosage in the procedure.

5/5 4:35 AM
Subject hostile and thrashing violently. First and secondary restraints once again replaced. Inhalation anesthesia applied.

5/5 4:39 AM
Anesthesia finally successful. Subject unconscious.

5/5 4:42 AM
Implant procedure initiated.

5/5 4:54 AM
Venom port successfully installed. Implant complete. Venom drug can now be directly introduced to subject's brain at will.

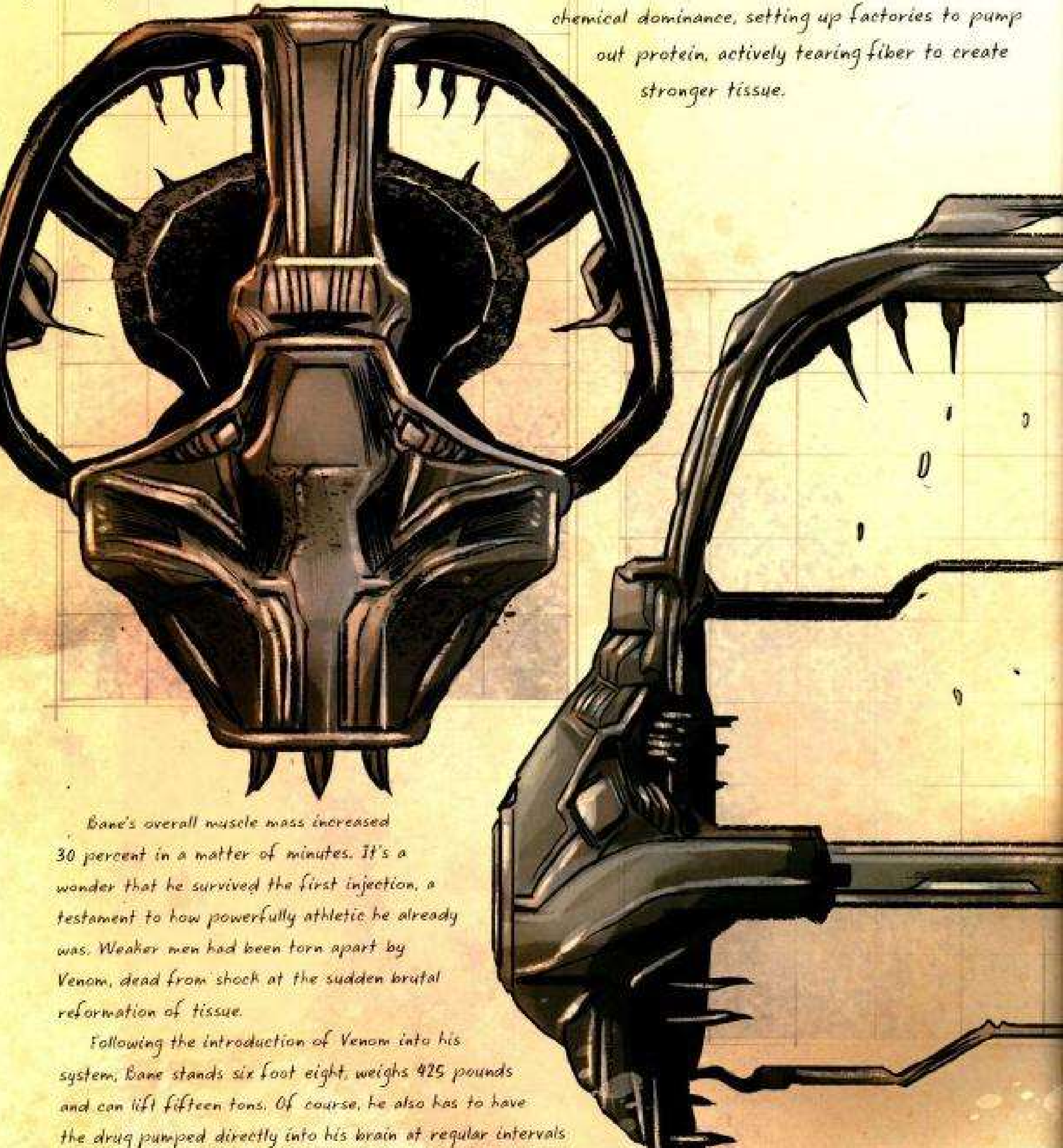
5/5 5:17 AM
Surgery complete. Vital signs remain stable.

5/5 7:22 AM
Subject awake and in stable condition. Minor skirmish in recovery room. Doctors Monsivais and Rodriguez placed in intensive care.

While I'm glad I was able to track down the notes from the doctor who originally injected Bane with Venom, I find it difficult to get past the gross injustice of using unwilling and captive subjects in dangerous medical testing. To hear Bane tell it, he asked for the procedure. That defies conventional logic but is certainly in line with his enormous ego.

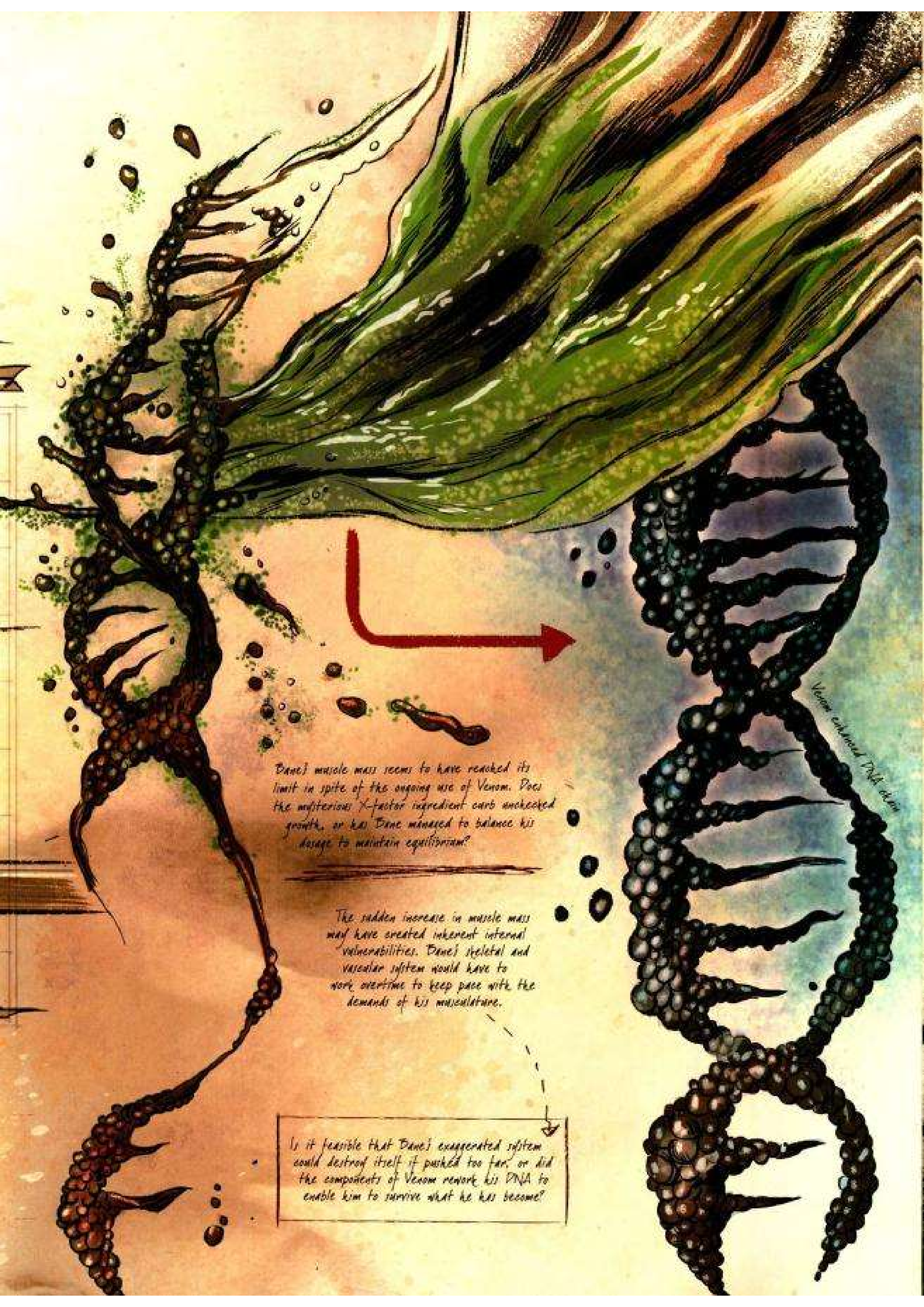
Venom in the Body

When typical AAS are added to the body, they travel through the bloodstream toward muscle tissue. There, they dock with androgen receptors and interact with the muscle cell's DNA, stimulating the protein synthesis process. From what I've been able to gather, Venom attacks the muscle cells in a violent surge of chemical dominance, setting up factories to pump out protein, actively tearing fiber to create stronger tissue.



Bane's overall muscle mass increased 30 percent in a matter of minutes. It's a wonder that he survived the first injection, a testament to how powerfully athletic he already was. Weaker men had been torn apart by Venom, dead from shock at the sudden brutal reformation of tissue.

Following the introduction of Venom into his system, Bane stands six foot eight, weighs 425 pounds and can lift fifteen tons. Of course, he also has to have the drug pumped directly into his brain at regular intervals for it to maintain effectiveness. The half-life of the addictive compound is just under six hours and he relies on its use heavily. Without it, he loses his physical superiority. Sudden withdrawal from something as powerful as Venom could lead Bane to experience serious medical conditions ranging from severe physical pain to systemic shock.



Bane's muscle mass seems to have reached its limit in spite of the ongoing use of Venom. Does the mysterious X-factor ingredient curb unchecked growth, or has Bane managed to balance his dosage to maintain equilibrium?

The sudden increase in muscle mass may have created inherent internal vulnerabilities. Bane's skeletal and vascular system would have to work overtime to keep pace with the demands of his musculature.

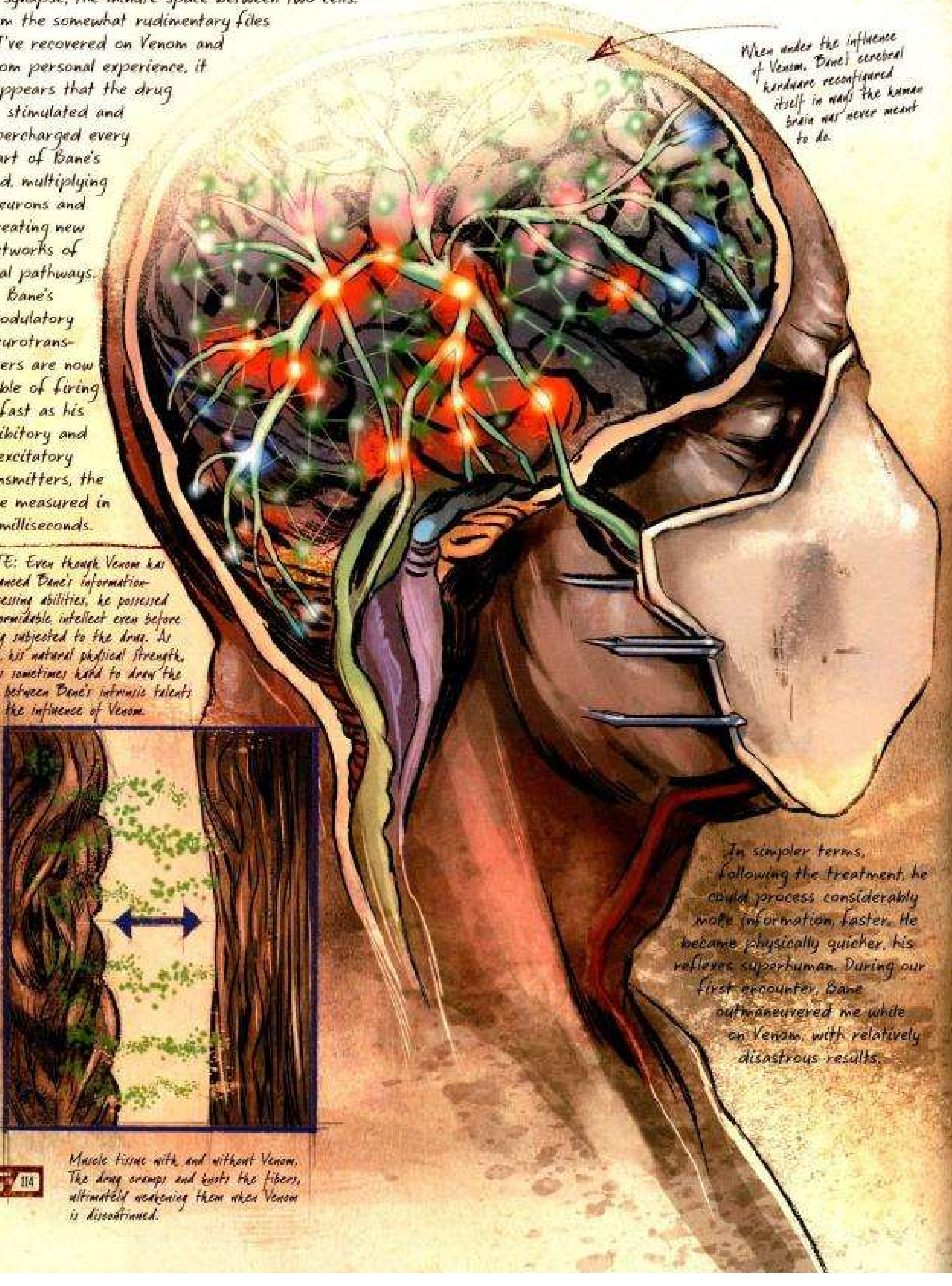
Is it feasible that Bane's exaggerated system could destroy itself if pushed too far, or did the components of Venom rework his DNA to enable him to survive what he has become?

Venom in the Brain

Our minds communicate through chemistry and electricity. In the human brain, neurons pass electrical pulses down their axons, shooting chemical neurotransmitters to the next brain cell via a synapse, the minute space between two cells.

From the somewhat rudimentary files I've recovered on Venom and from personal experience, it appears that the drug stimulated and supercharged every part of Bane's mind, multiplying neurons and creating new networks of neural pathways. Bane's modulatory neurotransmitters are now capable of firing as fast as his inhibitory and excitatory transmitters, the time measured in milliseconds.

NOTE: Even though Venom has enhanced Bane's information-processing abilities, he possessed a formidable intellect even before being subjected to the drug. As with his natural physical strength, it is sometimes hard to draw the line between Bane's intrinsic talents and the influence of Venom.



When under the influence of Venom, Bane's cerebral hardware reconfigured itself in ways the human brain was never meant to do.

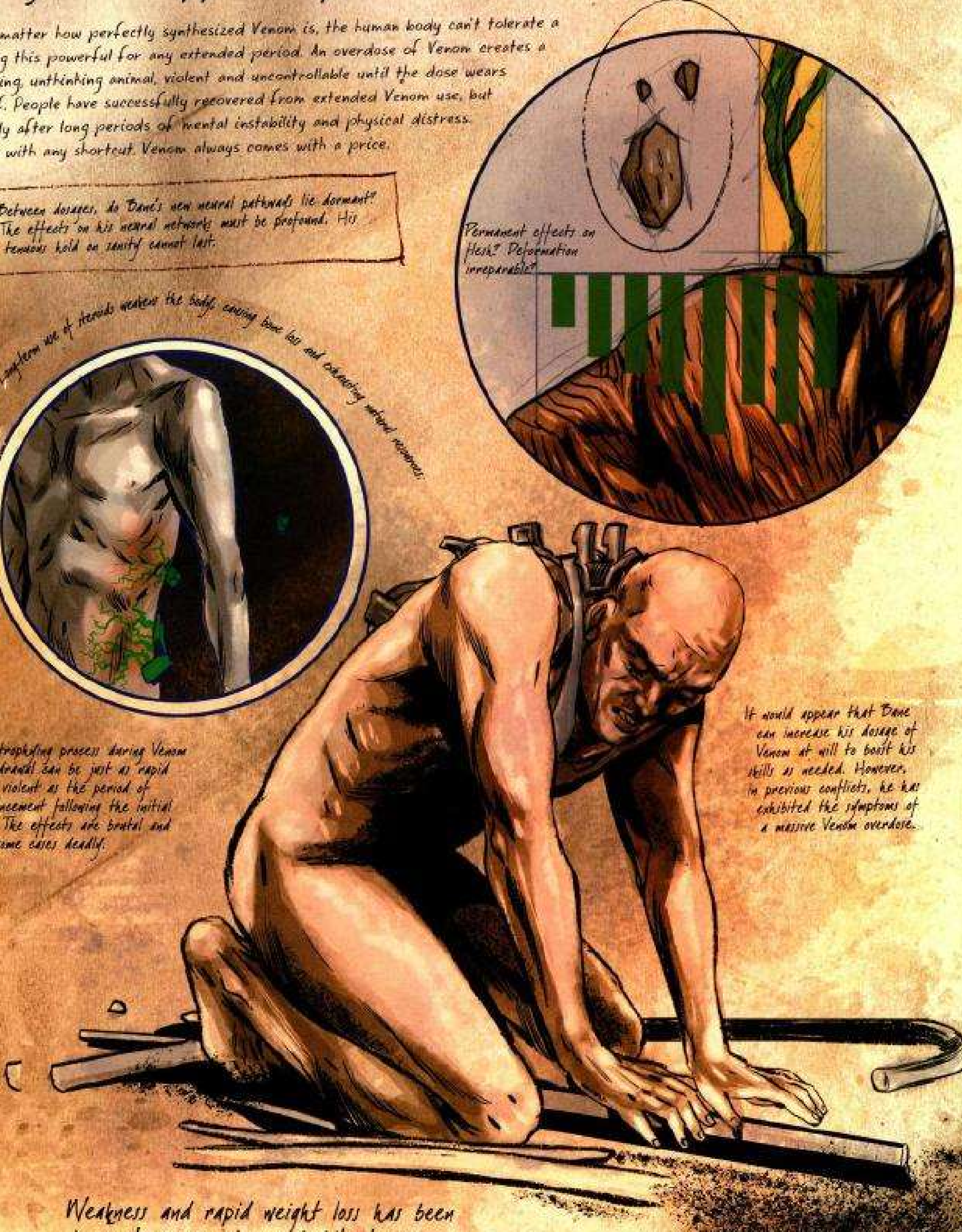
In simpler terms, following the treatment, he could process considerably more information, faster. He became physically quicker, his reflexes superhuman. During our first encounter, Bane outmaneuvered me while on Venom, with relatively disastrous results.

Muscle tissue with and without Venom. The drug cramps and knots the fibers, ultimately weakening them when Venom is discontinued.

Long-Term Effects of Venom

No matter how perfectly synthesized Venom is, the human body can't tolerate a drug this powerful for any extended period. An overdose of Venom creates a raging, unthinking animal, violent and uncontrollable until the dose wears off. People have successfully recovered from extended Venom use, but only after long periods of mental instability and physical distress. As with any shortcut, Venom always comes with a price.

Between dosages, do Bane's new neural pathways lie dormant? The effects on his neural networks must be profound. His tenuous hold on sanity cannot last.



Permanent effects on flesh? Deformation irreparable?

Long-term use of steroids weakens the body, causing bone loss and exhausting natural resources.

The atrophying process during Venom withdrawal can be just as rapid and violent as the period of enhancement following the initial dose. The effects are brutal and in some cases deadly.

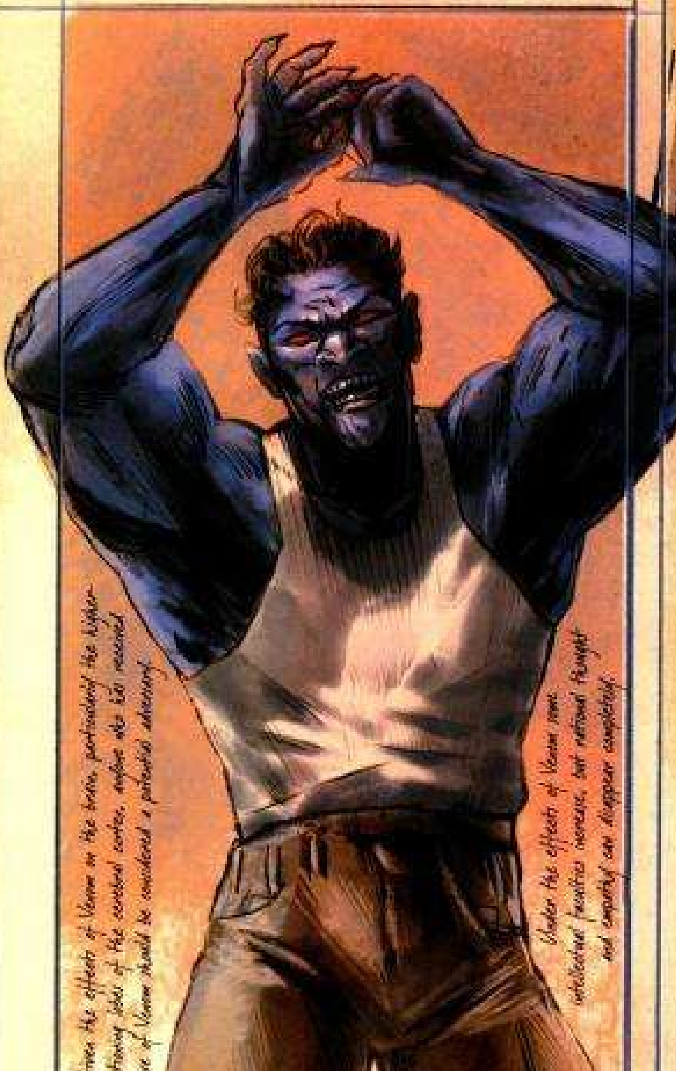
It would appear that Bane can increase his dosage of Venom at will to boost his skills as needed. However, in previous conflicts, he has exhibited the symptoms of a massive Venom overdose.

Weakness and rapid weight loss has been known to occur when a habitual user attempts to quit Venom cold turkey.

OTHER VENOM USERS

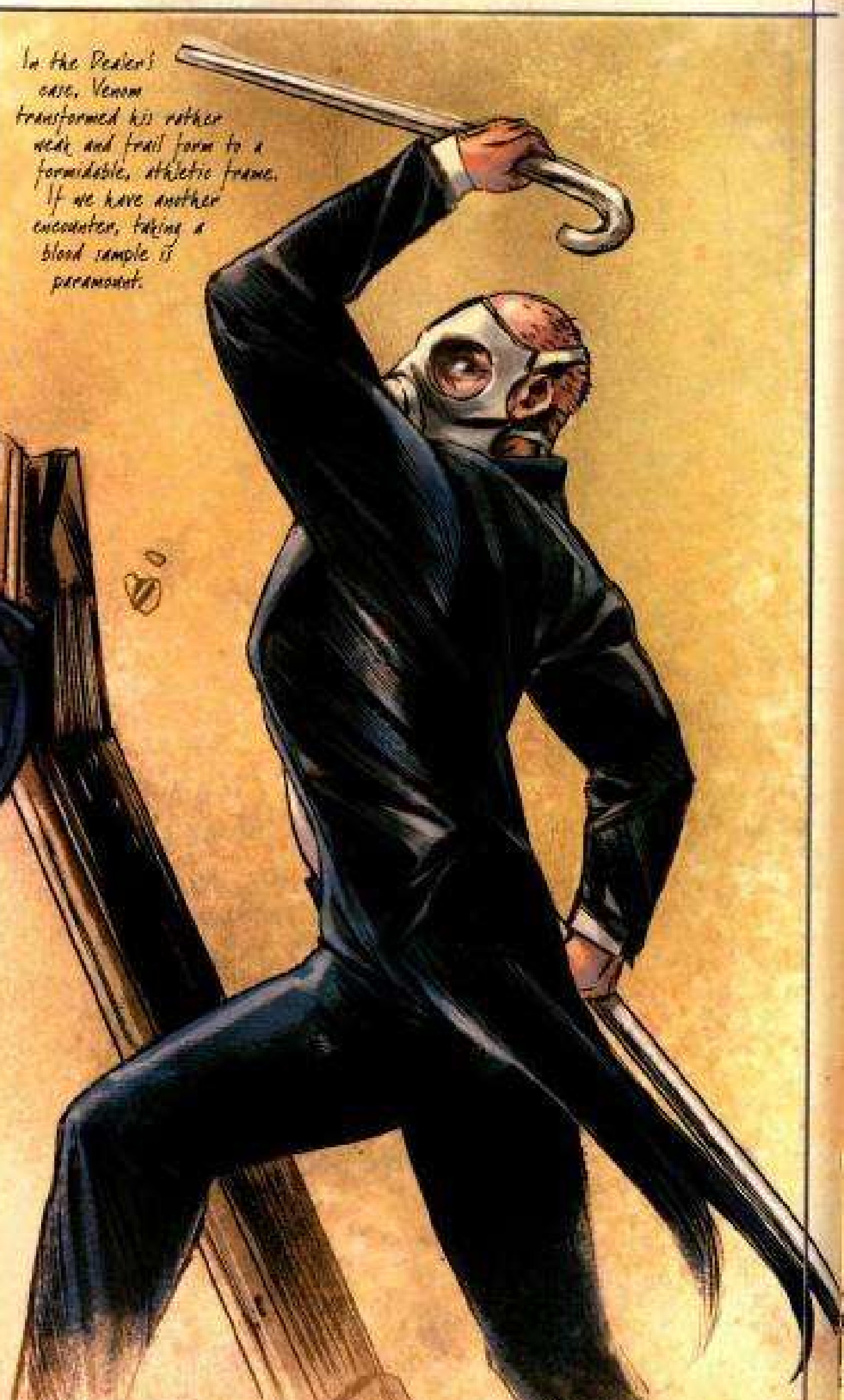
Emperor Blackgate

Once an associate of the Penguin, Ignatius Ogilvy used Venom to re-create himself as a villainous metahuman. However, he also mixed the drug with a formula that scientist Kirk Langstrom used to transform himself into the villain Man-Bat, plus an unknown concoction created by Poison Ivy. The result has caused permanent alterations to Ogilvy: Along with increased strength and speed he has developed bluish skin and Man-Bat-like features that include pointed ears. After assuming criminal control of the Blackgate Penitentiary, he declared himself Emperor Blackgate. It's unclear if he continues to use Venom at this time, but his physical bulk has not subsided.



Given the effects of Venom on the brain, particularly the higher-functioning lobes of the cerebral cortex, anyone who has received a dose of Venom should be considered a potential adversary.

Under the effects of Venom some intellectual faculties increase, but rational thought and empathy can disappear completely.



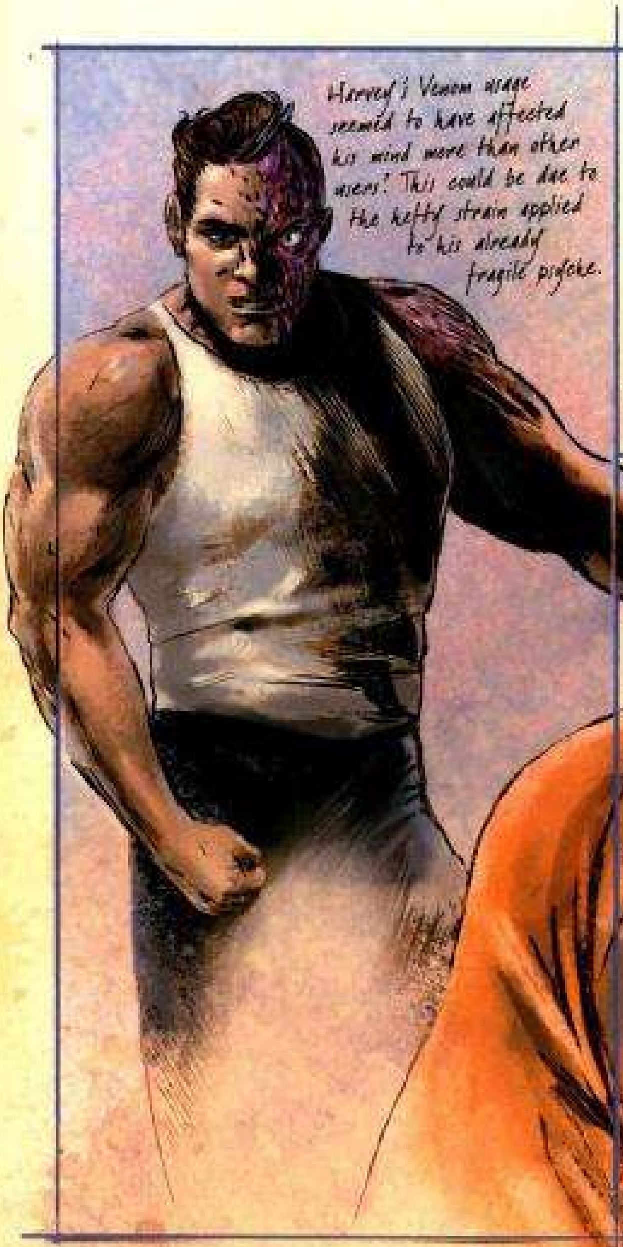
In the Dealer's case, Venom transformed his rather weak and frail form to a formidable, athletic frame. If we have another encounter, taking a blood sample is paramount.

The Dealer

Etienne Guiborg, also know as the Dealer, is the mysterious auctioneer of the Mirror House, a criminal organization that sells illegal superhero and super-villain equipment, along with crime scene "memorabilia." The Dealer once used a concoction made of Venom and Man-Bat serum as part of a last-resort escape plan in case his illegal auctions were ever interrupted by the authorities. Its effects were only temporary, but, given the resources at his command, it should be assumed that he is able to produce another dose of the formula.

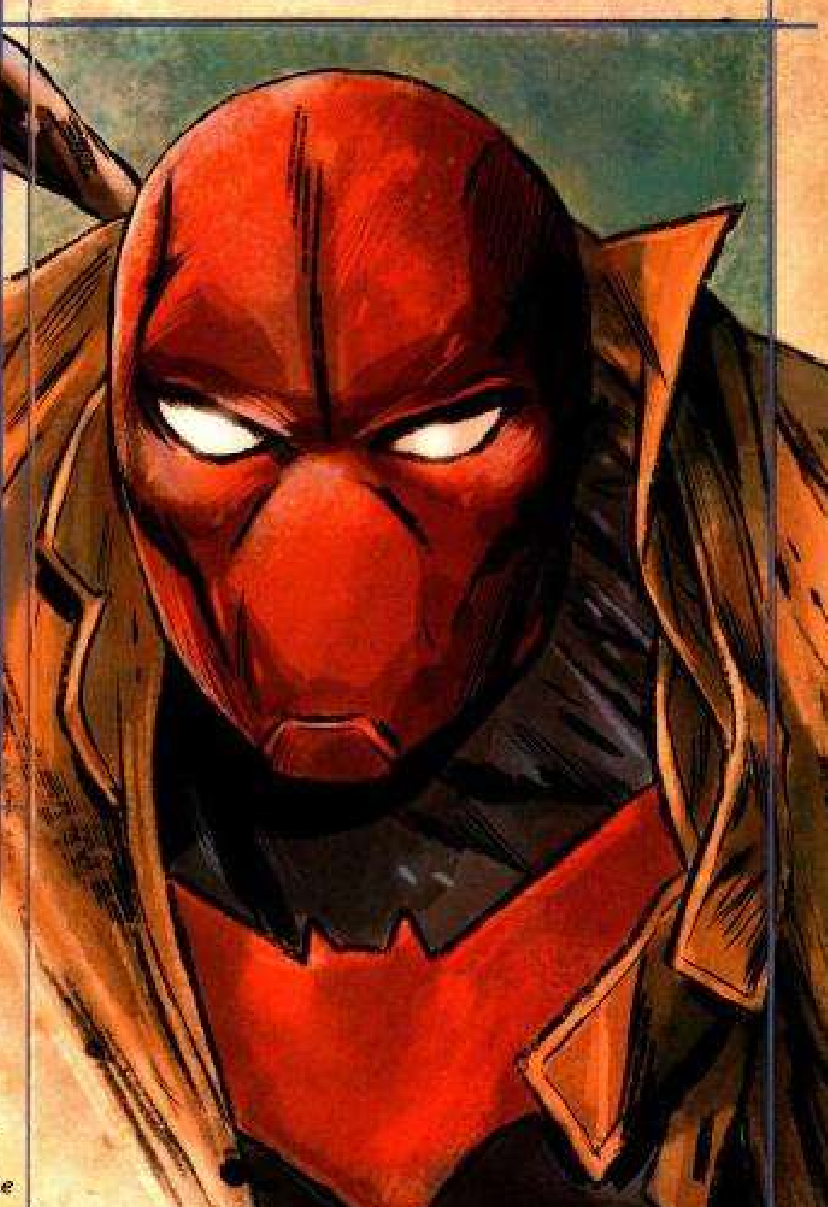
Harvey Dent (aka Two-Face)

During one of his last incarcerations at Arkham Asylum, Harvey Dent was given a combination of Venom and another serum that briefly rendered him strong, fearless, and much, much larger. His obsession with duality was suppressed by the effects of the drug and he demanded to be called One-Face. Dent and I subsequently fought during a riot in Arkham--I managed to survive the encounter only because Dent, lacking Bane's impeccable physique, was unable to process the toxic combination of drugs, leading him to suffer a physical breakdown.



Harvey's Venom usage seemed to have affected his mind more than other users! This could be due to the hefty strain applied to his already fragile psyche.

Jason and I have had words about his use of Venom. Despite his bravado, I believe he understands my concerns and will act more responsibly in the future.



Red Hood

The second Robin, Jason Todd, and I have a long history. Unfortunately, that past has been tainted to a point that we're only just now learning to accept each other's dramatically different methods. Nevertheless, I can't condone his use of Venom to get out of a tight spot or two while operating as the vigilante known as the Red Hood. It seems he hasn't used the drug in quite a while, but I'm keeping a close eye on him, with the intention of intervening if needed.

WEAKNESSES

At first glance, Bane doesn't appear to have any blind spots or weak links. He's a highly trained fighter who learned from some of the best brawlers prison had to offer, and his access to Venom gives him a superhuman advantage. He's extremely motivated and has been shown to overcome difficult situations by force of will alone. What's more, he's highly intelligent and a master manipulator. He lives his life as if he's in a game of human chess. Every move is thought-out and well researched.

The obvious first step in any battle with Bane is to cut off his Venom flow. Take away the source of his strength, and you're one step closer to leveling the playing field. But Bane has been known to overcome his Venom dependency and has still presented a formidable threat on those occasions. That's when ego comes into play.

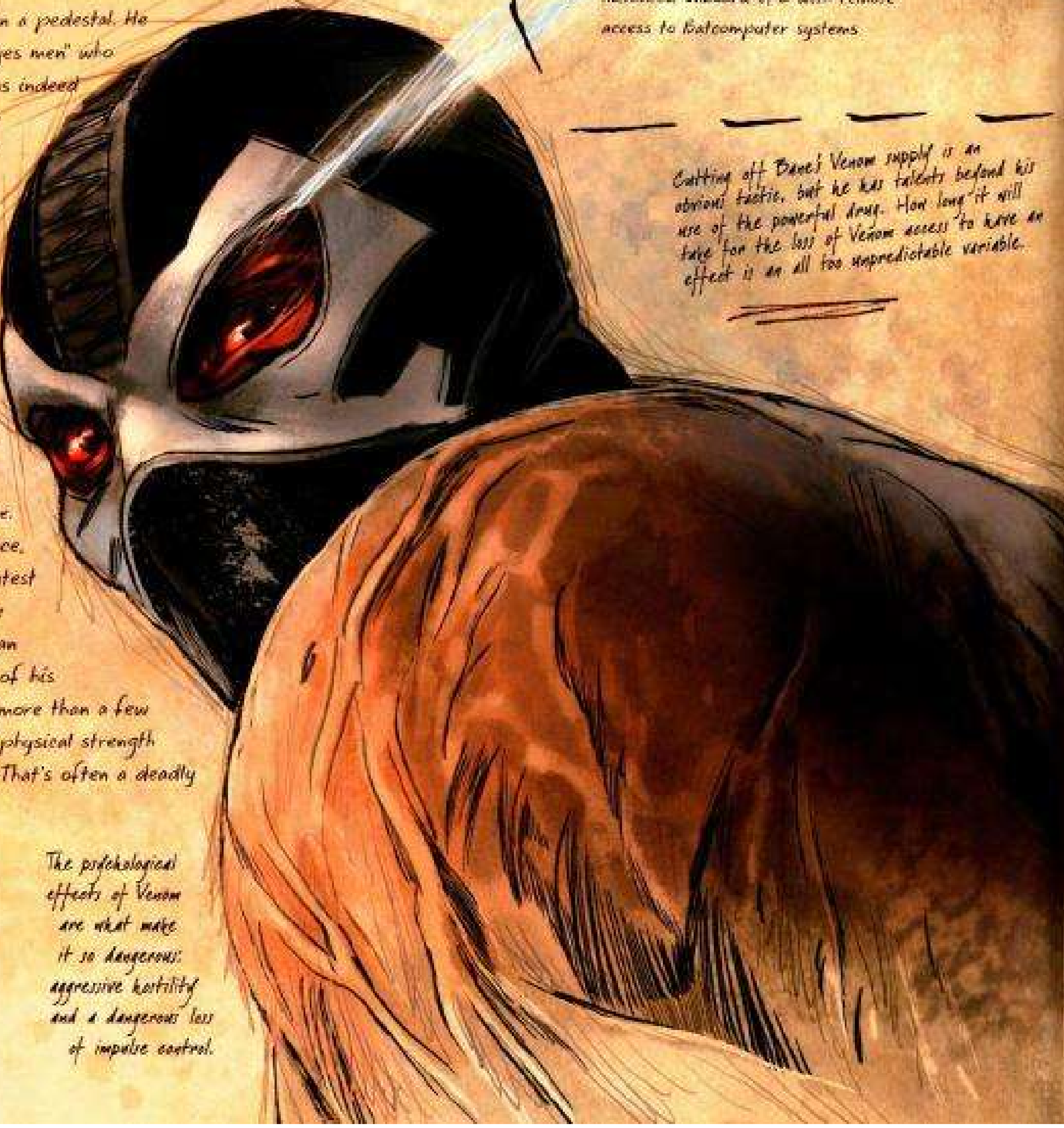
After he conquered Peña Duro, Bane became used to people putting him up on a pedestal. He became surrounded by "yes men" who convinced him that he was indeed the best at everything he attempted. This led Bane to develop a massive ego that can certainly be exploited. Play into Bane's vanity, make him think he's in control, and then strike when he considers you weakest. It's easy to convince someone they're unstoppable when they already believe that's true. Besides Venom dependence, this is surely Bane's greatest weakness. Regrettably, he is also a brilliant tactician and is likely well aware of his shortcomings. I've seen more than a few people focus on Bane's physical strength and ignore his intellect. That's often a deadly mistake.

Thrasher Suit

One of my most practical armored Batsuits is the Thrasher model, first used when the Batcave was invaded by a horde of Talon soldiers from Gotham City's clandestine criminal society, the Court of Owls. The suit's durability and bulk make it perfect for taking on multiple skilled opponents, or balancing the scales when I'm out-muscled by an opponent like Bane.

FEATURES INCLUDE:

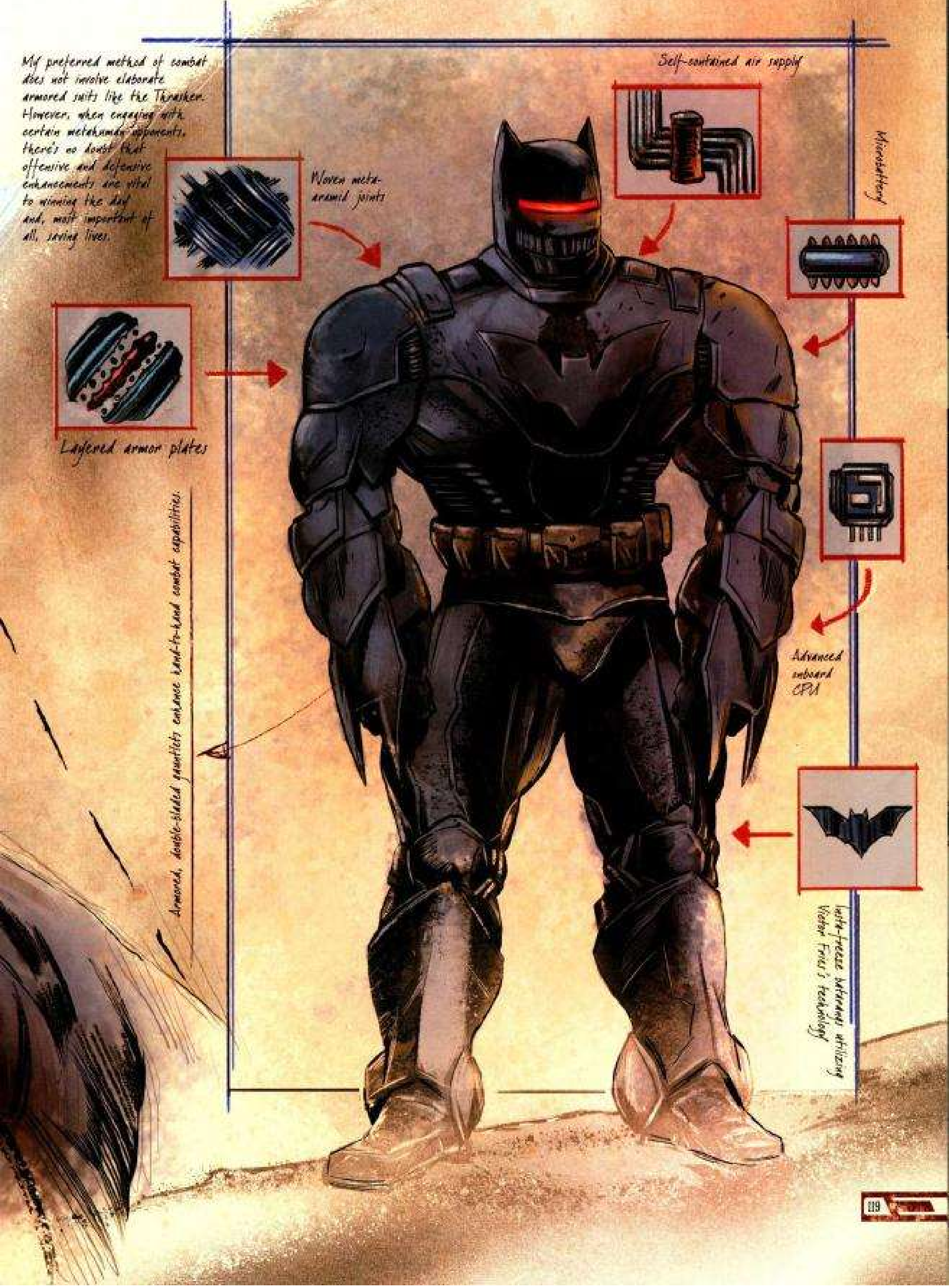
- Armor composed of meta-aramid fibers of my own design (tougher than Kevlar)
- Powerful insulation from extreme heat and cold
- Long-lasting semisolid flow microbattery
- Oxygen supply capable of lasting weeks
- Projectile electric taser wire
- Insta-freeze batarang supply
- Advanced onboard CPU with remote access to Batcomputer systems



Cutting off Bane's Venom supply is an obvious tactic, but he has talents beyond his use of the powerful drug. How long it will take for the loss of Venom access to have an effect is an all too unpredictable variable.

The psychological effects of Venom are what make it so dangerous: aggressive hostility and a dangerous loss of impulse control.

My preferred method of combat does not involve elaborate armored suits like the Thrasher. However, when engaging with certain metahuman opponents, there's no doubt that offensive and defensive enhancements are vital to winning the day and, most important of all, saving lives.


Self-contained air supply
Woven meta-aramid joints
Microbattery
Layered armor plates
Armored, double-bladed gauntlets enhance hand-to-hand combat capabilities.
Advanced onboard CPU
Anti-freeze batarangs utilizing Victor Fries's technology

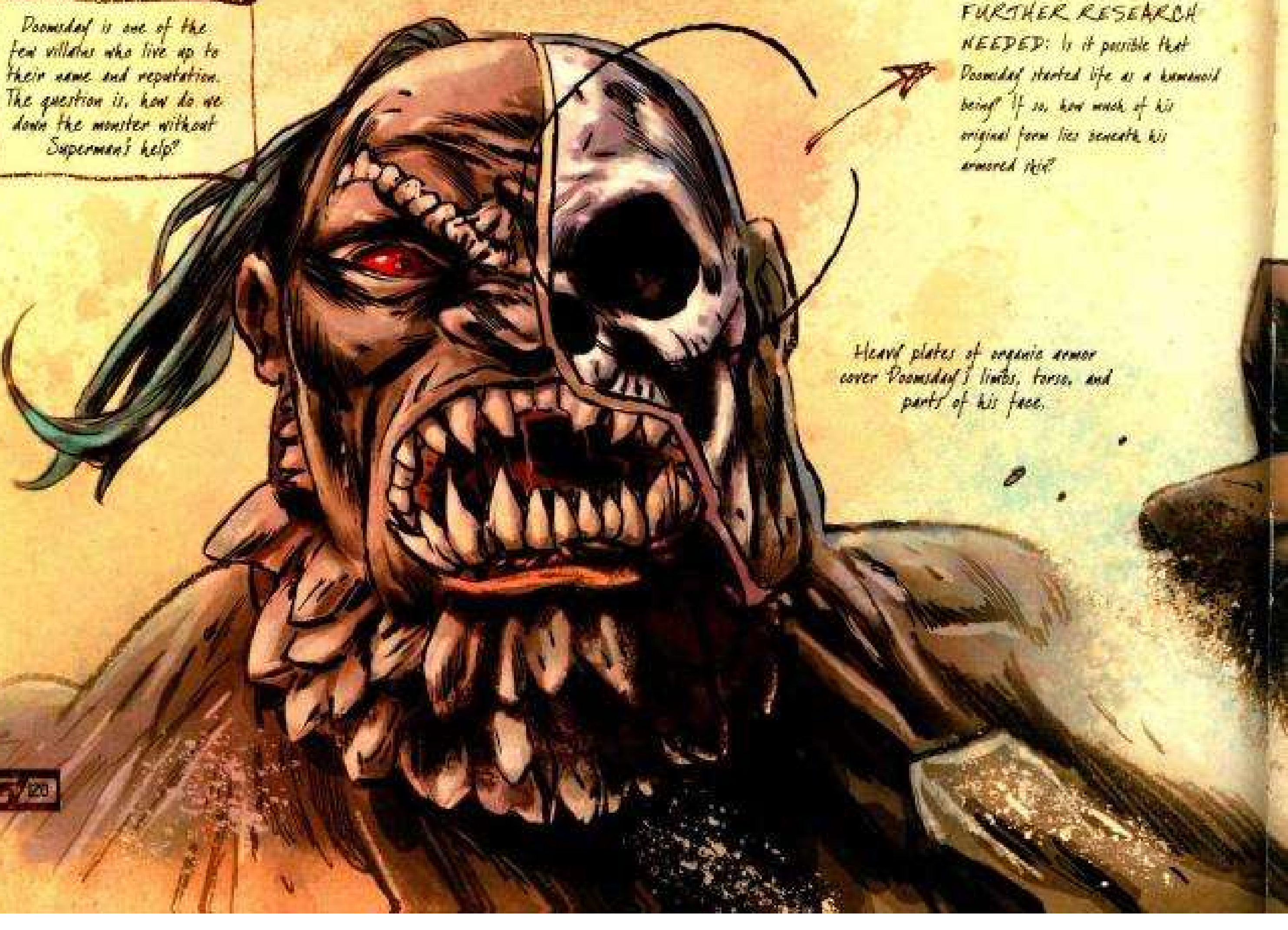
DOOMSDAY

Essentially a Kryptonian killing machine, the powerful creature known as Doomsday attempted to raze Krypton shortly before the planet was destroyed by its own unstable core. Banished to an alternate dimension called the Phantom Zone, Doomsday later weakened the barriers of its prison and traveled to Earth, seeking to destroy Superman. Superman defeated the monster, but only after a battle he'd later declare the most brutal of his life.

Doomsday evolved over the years, proving to be a deadly challenge to Superman every time it reemerged. One of the monster's incarnations even had the capacity to absorb life, draining energy from other organisms. Defensively, Doomsday reacts adaptively to whatever weapons are used against it. Designed to evolve at hyper speed, when physically injured, Doomsday can almost instantly re-create the damaged areas of its body, quickly developing new tissue that will be resistant to the method of attack that caused the injury. Within a handful of regenerative cycles, often only seconds apart, the method of attack becomes entirely ineffective.

Doomsday seems to be immortal and is able to regenerate from bare shreds of genetic material. Destroy the creature, and cellular debris will eventually spawn a new version of Doomsday. It can only be "killed" the same way once, because its new incarnation will already have evolved to overcome its previous weakness.

I've had run-ins with Doomsday, but most of what I know about its history and capabilities I've learned from Superman. The stories seemed fantastic at first, but after watching Superman slowly transform into a version of the creature after ingesting its ashes on one occasion, I don't doubt the legends. In fact, after gathering some specific data during Superman's brief transformation, what I learned about Doomsday's unusual properties make the myths seem tame.



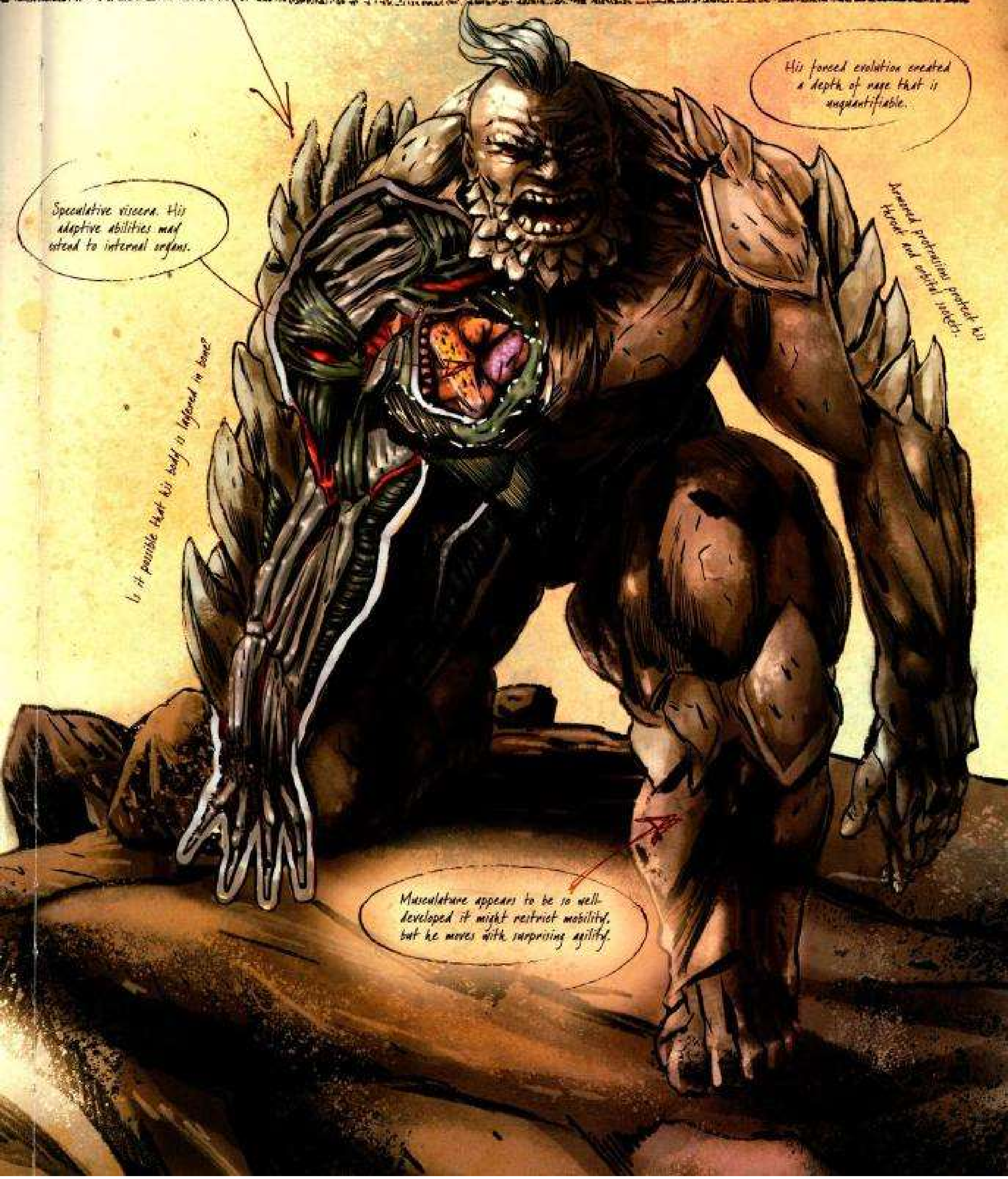
Doomsday is one of the few villains who live up to their name and reputation. The question is, how do we down the monster without Superman's help?

FURTHER RESEARCH NEEDED: Is it possible that Doomsday started life as a humanoid being? If so, how much of his original form lies beneath his armored skin?

Heavy plates of organic armor cover Doomsday's limbs, torso, and parts of his face.

Following on from my point regarding the importance of carrying out parallel studies on the nemeses of key research subjects, there is no better way of understanding Superman's vulnerabilities than through studying Doomsday, the being that has brought him closest to total defeat.

The density of muscle and armor must be supported by a nearly indestructible skeletal form.



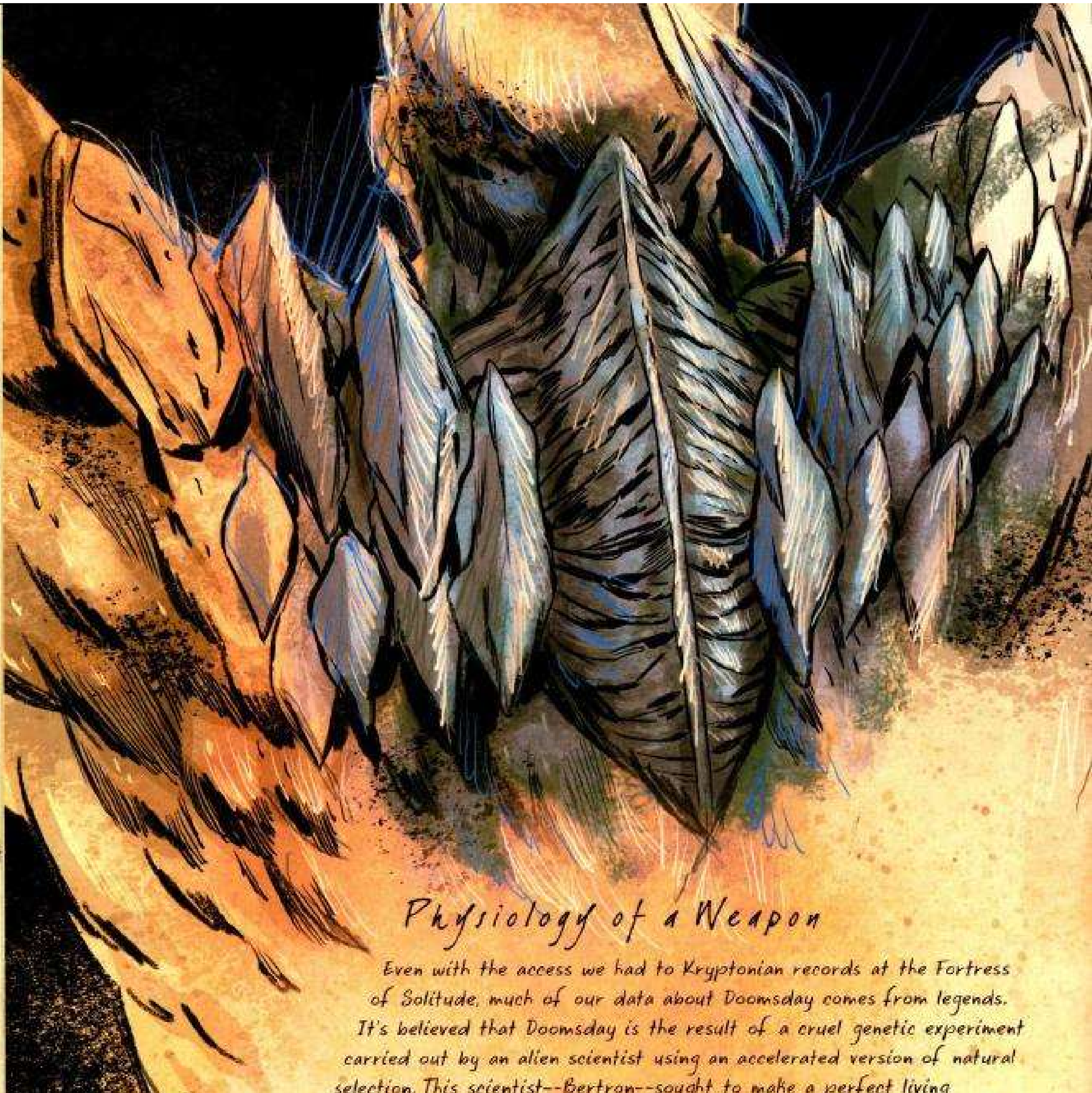
His forced evolution created a depth of rage that is unquantifiable.

Speculative viscera. His adaptive abilities may extend to internal organs.

Armored protrusions protect his throat and orbital sockets.

Is it possible that his body is layered in bone?

Musculature appears to be so well-developed it might restrict mobility, but he moves with surprising agility.



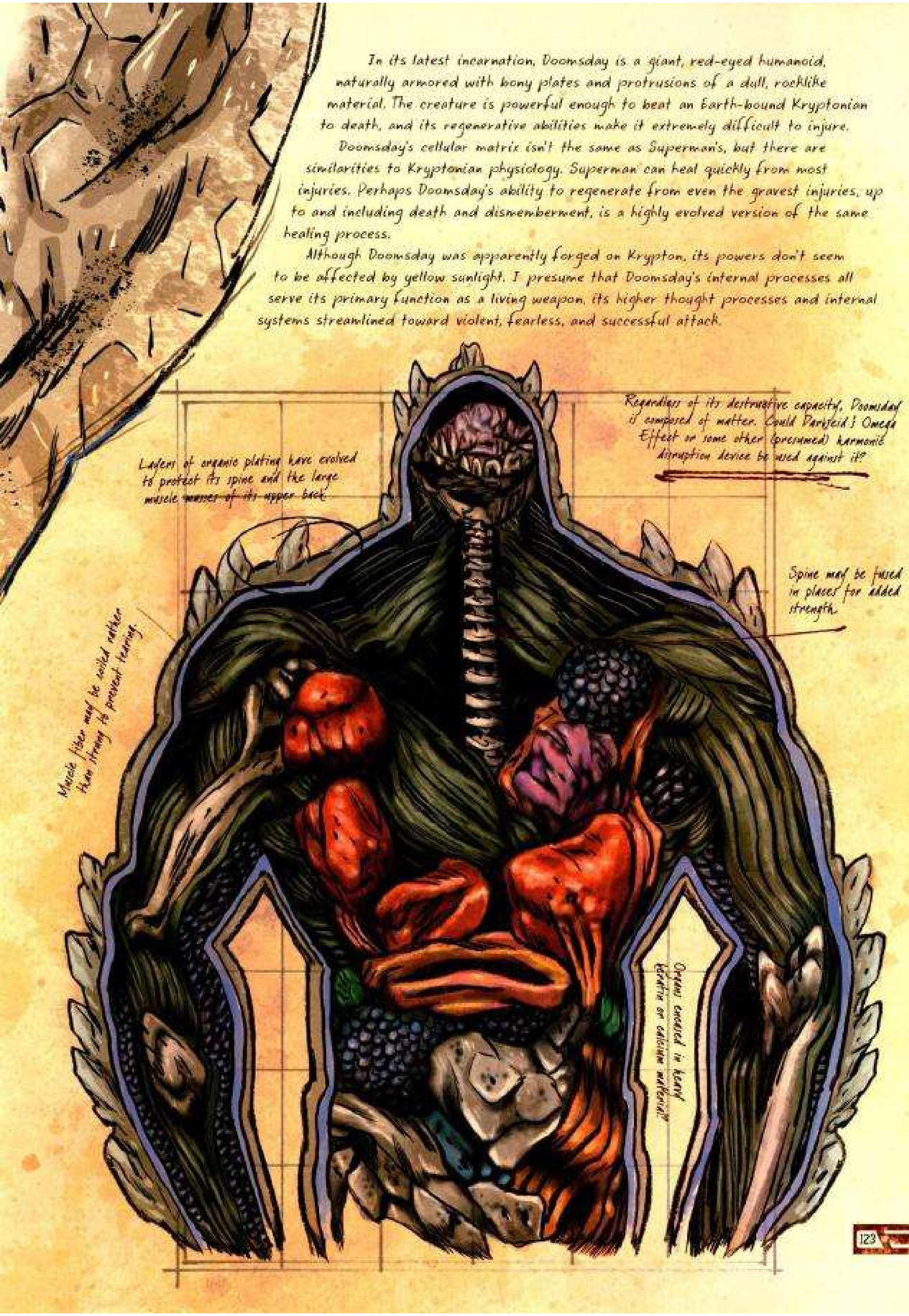
Physiology of a Weapon

Even with the access we had to Kryptonian records at the Fortress of Solitude, much of our data about Doomsday comes from legends. It's believed that Doomsday is the result of a cruel genetic experiment carried out by an alien scientist using an accelerated version of natural selection. This scientist--Bertron--sought to make a perfect living organism. He took a child--possibly Kryptonian, or another genetically similar being--and exposed it to Krypton's deadly prehistoric environment. The child inevitably died in the wild and was cloned, regrown over and over, each new version developing genetic traits that would protect it from the fate of its predecessor. After decades of repetition, a rage-tormented monster with the genetic memory of all its previous incarnations learned to thrive in the harshest of environments. According to legend, it killed Bertron and went on to slaughter millions through the centuries.

In its latest incarnation, Doomsday is a giant, red-eyed humanoid, naturally armored with bony plates and protrusions of a dull, rocklike material. The creature is powerful enough to beat an Earth-bound Kryptonian to death, and its regenerative abilities make it extremely difficult to injure.

Doomsday's cellular matrix isn't the same as Superman's, but there are similarities to Kryptonian physiology. Superman can heal quickly from most injuries. Perhaps Doomsday's ability to regenerate from even the gravest injuries, up to and including death and dismemberment, is a highly evolved version of the same healing process.

Although Doomsday was apparently forged on Krypton, its powers don't seem to be affected by yellow sunlight. I presume that Doomsday's internal processes all serve its primary function as a living weapon, its higher thought processes and internal systems streamlined toward violent, fearless, and successful attack.



Regardless of its destructive capacity, Doomsday is composed of matter. Could Darkseid's Omega Effect or some other (presumed) harmonic disruption device be used against it?

Layers of organic plating have evolved to protect its spine and the large muscle masses of its upper back.

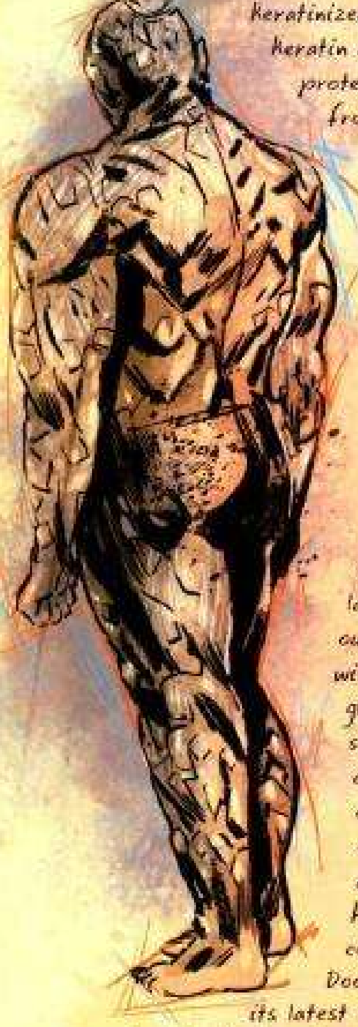
Spine may be fused in places for added strength.

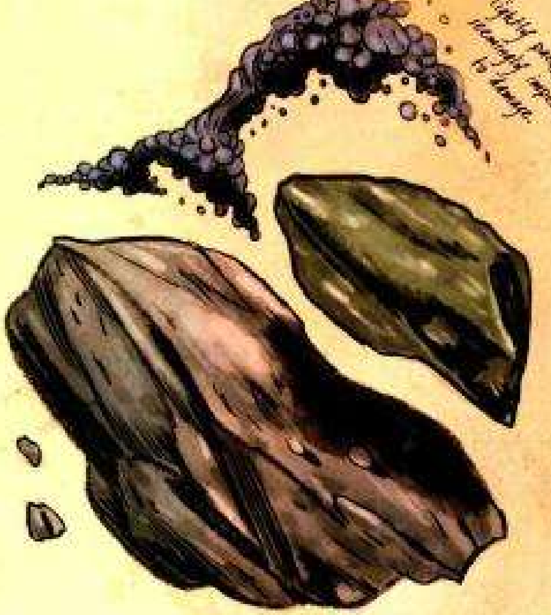
Muscle fiber may be coiled rather than strung to prevent tearing.

Organs encased in heavy keratin or calcium material?

Protective Armor

Assuming that Doomsday's initial form was Kryptonian, there must have been an incredible evolution of keratinized matter in its tissue, keratin being the fibrous protein found in everything from hair to hooves in mammals. Keratin is also contained in a reptile's dermal scales. Doomsday isn't scaled so much as plated, inside and out. When Superman suffered the first visible effects of the Doomsday virus, samples of his dermal cells showed increasing layers of keratin-rich outer cells interwoven with a long chain polymer glucose derivative--something like chitin, a characteristic component of an anthropod's exoskeleton, but denser and much harder. Superman couldn't break through Doomsday's armor during its latest incarnation. The creature is literally too strong to be physically destroyed. With a destructive capacity far greater than many man-made nuclear weapons, Doomsday is a force to be reckoned with.





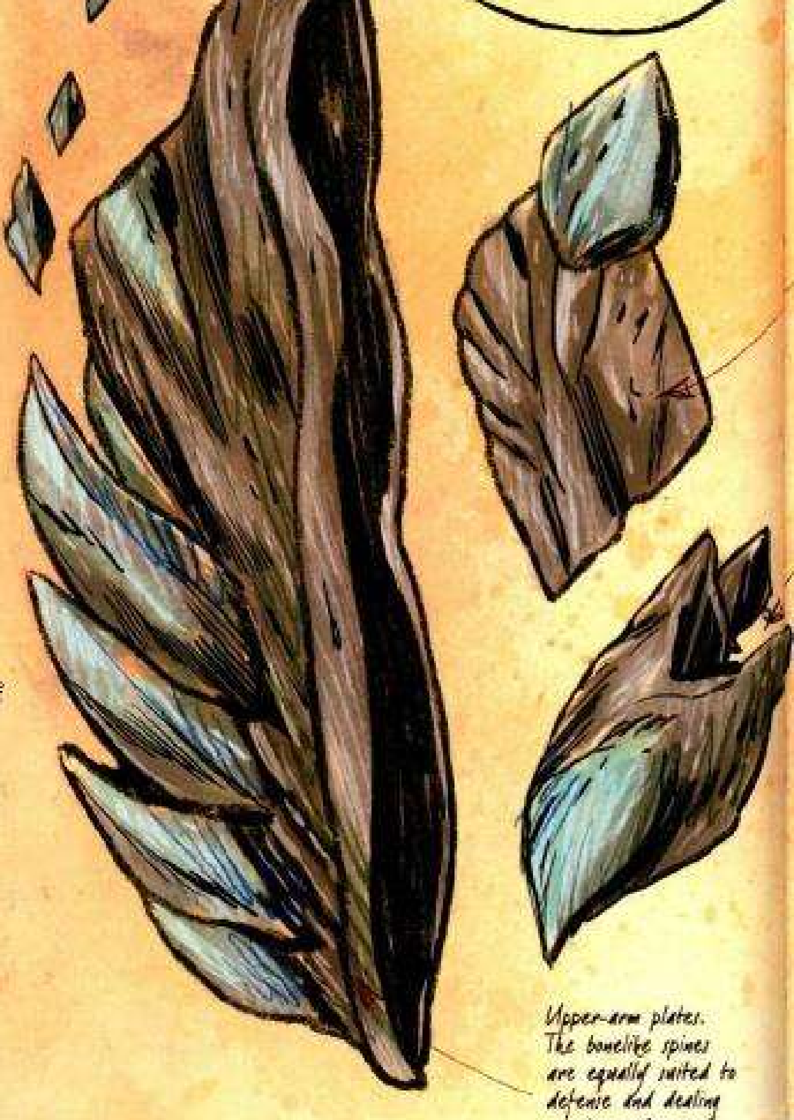
Tightly packed dead cells, seemingly impervious to damage.

Although I am aware that it is somewhat illogical to map the armor of a creature that is constantly evolving into new forms, my work here has helped me understand how Doomsday's numerous plates may fit together. My ultimate goal is to locate weak spots or at least areas where the plates could perhaps be separated to reveal vulnerable areas beneath.

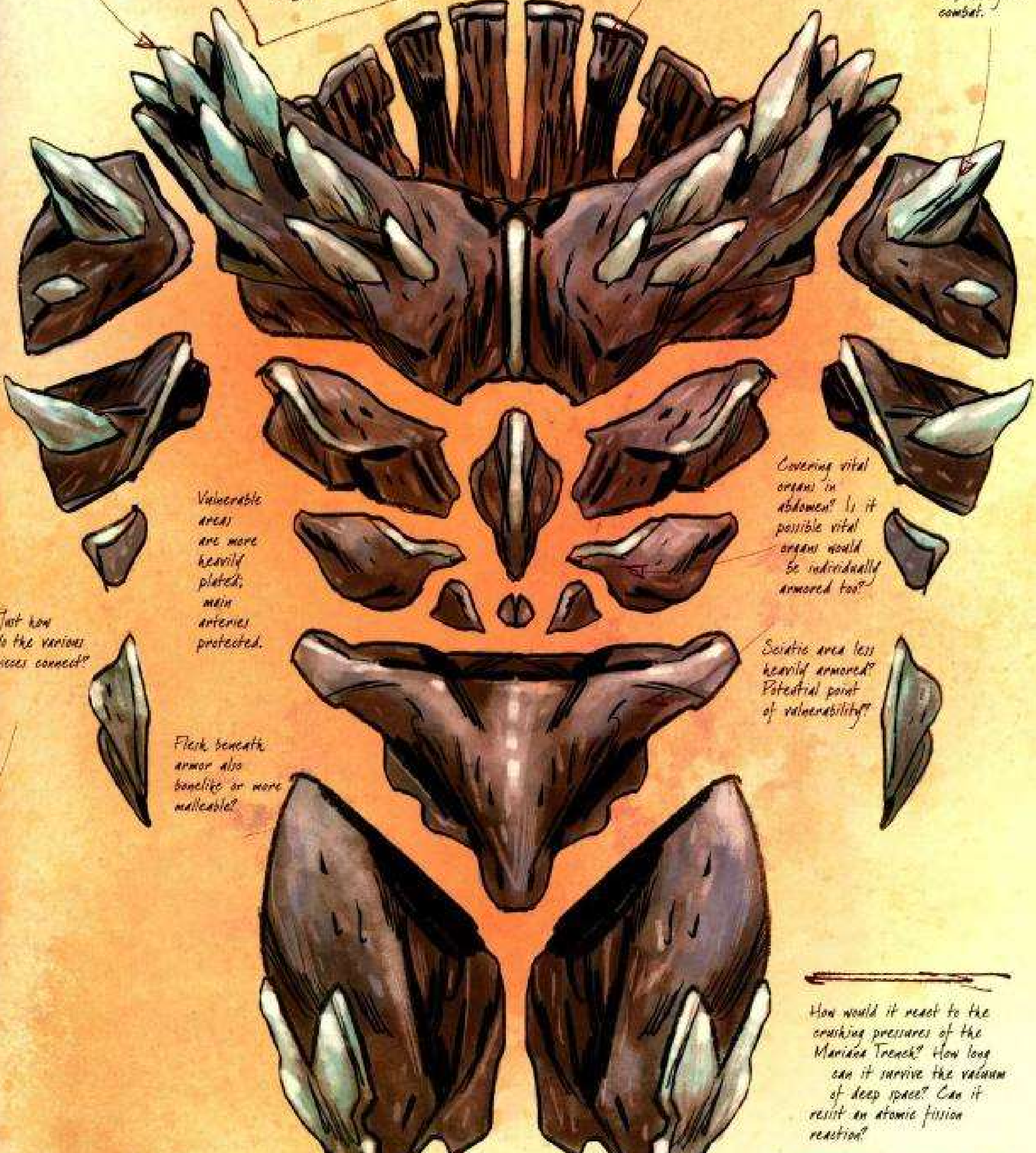
As part of my studies I've also extensively examined organic armor in nature, in everything from the bony neck frill of the dinosaur Triceratops to the plates of dermal bone that cover the armadillo and the keratin scales of the pangolin. Along with providing me with a better understanding of Doomsday's defenses, the knowledge gleaned will also no doubt be applied to future Batsuit designs. It goes without saying that the natural world continues to be a source of inspiration for the Batman.

Beneath the external plating, Doomsday's entire body is likely a mass of tough scar tissue.

Perhaps the armor itself is actually scar tissue, fibrosis built up in layers?



Upper-arm plates. The bonelike spines are equally suited to defense and dealing maximum damage to enemies.



Prominent spines wreathing neck indicate it may be weak spot. Carotid arteries or equivalent?

Organic armor that can't be shattered and doesn't appear to degrade

Upper back reinforcement to protect spine? Attacks from behind unlikely to succeed.

STRONGER THAN KEVLAR?

Shoulder spine provides further neck defense. Also facilitates powerful barging capability in combat.

Vulnerable areas are more heavily plated; main arteries protected.

Covering vital organs in abdomen? Is it possible vital organs would be individually armored too?

Just how do the various pieces connect?

Sciatic area less heavily armored? Potential point of vulnerability?

Flesh beneath armor also bonelike or more malleable?

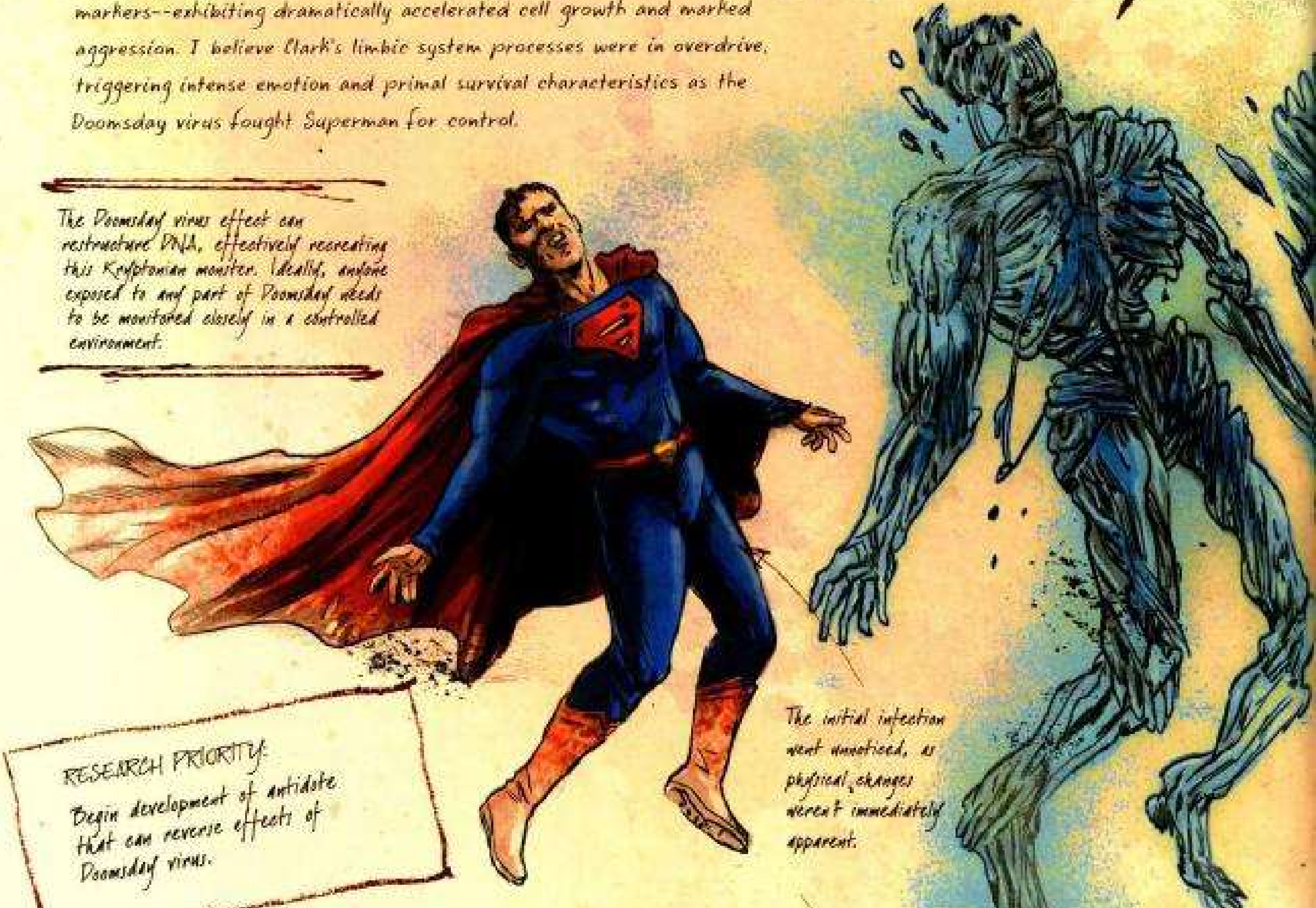
How would it react to the crushing pressures of the Mariana Trench? How long can it survive the vacuum of deep space? Can it resist an atomic fission reaction?

Superman's Doomsday Transformation

When Doomsday escaped the Phantom Zone, it required the combined efforts of many to defend our planet from its hugely destructive attack. Ultimately, Superman was the only combatant strong enough to fight the creature. Following a destructive, deadly battle that exhausted both combatants, Clark ripped Doomsday apart and inhaled the creature's particulate matter to keep its toxins from infecting the Earth. Within hours, Superman's DNA had been inexorably altered. Even the sensors at his Fortress of Solitude didn't recognize him.

The Doomsday "virus" infecting Superman worked quickly. Over a relatively short period, Clark began to take on Doomsday's characteristics, from gray, rock-like dermal plates to bursts of a genetics-deep rage against the living. Through pure will, Superman was able to control Doomsdays influence to some extent, but his dominance was unstable. Superman had become an international menace.

Working toward a cure, we were able to document some of the changes Superman underwent. The overall process included severe internal and external tissue changes, mostly related to his epithelial and endothelial dermal cells. He underwent a violent reformation of coding and noncoding regions in his DNA--that is, changes in his hidden and visible genetic markers--exhibiting dramatically accelerated cell growth and marked aggression. I believe Clark's limbic system processes were in overdrive, triggering intense emotion and primal survival characteristics as the Doomsday virus fought Superman for control.



The Doomsday virus effect can restructure DNA, effectively recreating this Kryptonian monster. Ideally, anyone exposed to any part of Doomsday needs to be monitored closely in a controlled environment.

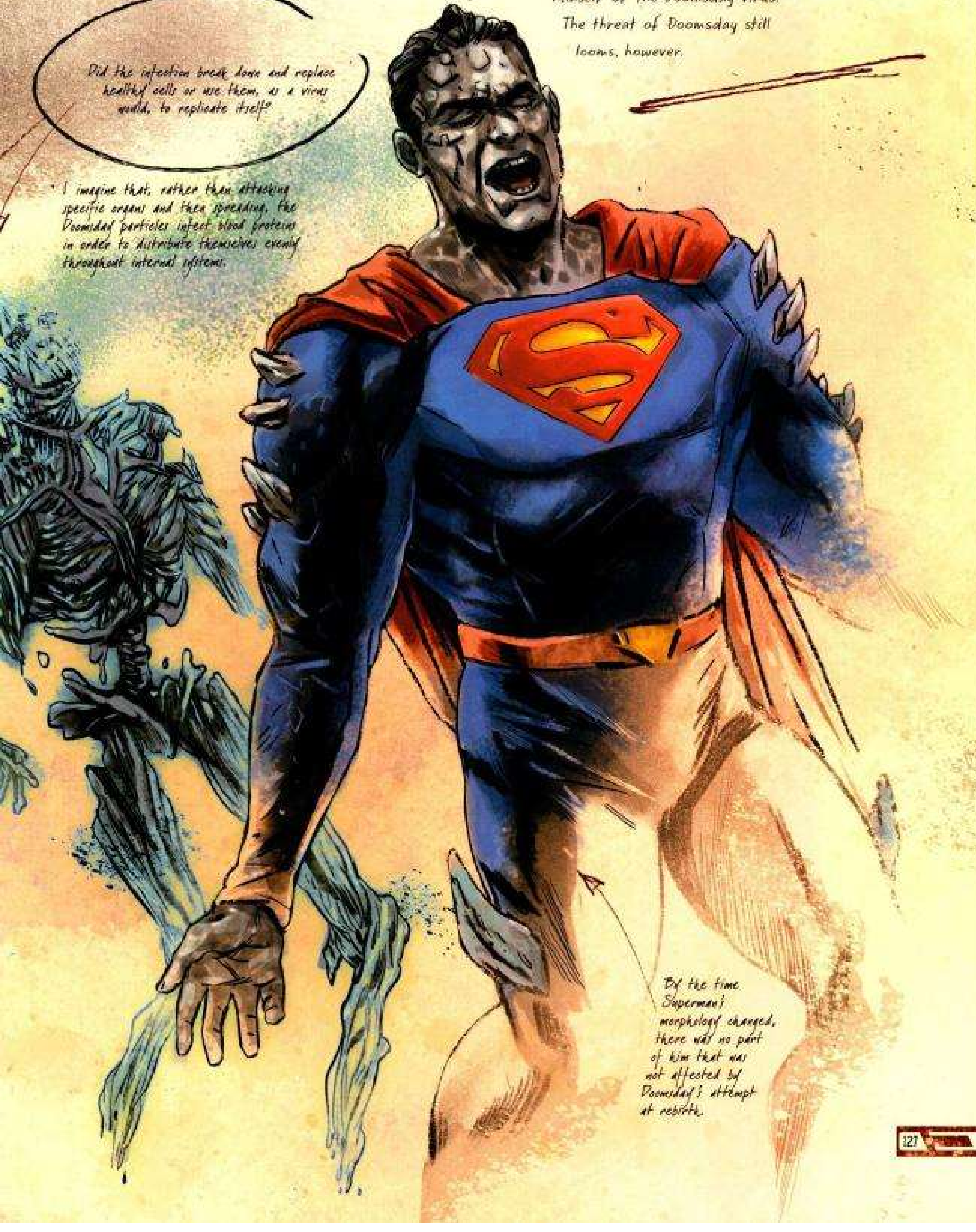
The initial infection went unnoticed, as physical changes weren't immediately apparent.

RESEARCH PRIORITY:
Begin development of antidote that can reverse effects of Doomsday virus.

Long shot but may be achievable if I can obtain a sample of Doomsday's DNA.

Check all known sites frequented by Doomsday for physical artifacts.

Eventually, through use of intense psionic power and a trip through a black hole, Superman was able to cure himself of the Doomsday virus. The threat of Doomsday still looms, however.



Did the infection break down and replace healthy cells or use them, as a virus would, to replicate itself?

I imagine that, rather than attacking specific organs and then spreading, the Doomsday particles infect blood proteins in order to distribute themselves evenly throughout internal systems.

By the time Superman's morphology changed, there was no part of him that was not affected by Doomsday's attempt at rebirth.

LEXCORP

Lex Luthor's research into Doomsday may prove to be useful, if or when we face this creature again. I doubt he'll part with his intel willingly, although we may be able to appeal to his self-interest. Alternately, hacking Luthor's data shouldn't prove too difficult.

Mercy,

Call a meeting with Drs. Hoshi and Branch. I think it's time to get a bit creative with our alien extermination project.

I've recently come to the rather disappointing conclusion that if Metropolis is ever going to be rid of its invader from beyond the stars, the answer might rest ironically in the realm of extraterrestrial weaponry. To put it simply, perhaps the best course of action in the case of our city's Superman problem would be to fight fire with fire.

Superman's closest brush with death was at the hands of another alien, the creature commonly dubbed Doomsday. More a force of nature than a living thing, Doomsday has grown more powerful with time and will probably only continue its evolution in the years to come. The most prudent time to take action on this would be the present, wouldn't you agree?

With that in mind, I'd like to drastically redirect Branch and Hoshi's research in their continued study of mind-control. I'd like them to take what they've learned from creatures like Brainiac, and madmen like that Jervis Tetch fellow in Gotham, and see if they might not be able to brainstorm some sort of microscopic device that could tame this excessively savage beast. Let them know that, as always, money is of little concern, and I can also procure the miniaturization research of Dr. Ray Palmer, if needed. Or, rather, I can have that information procured for me by one of the more unsavory professionals on our subsidiary's payroll.

Time is of the essence here, Mercy. The sooner my city is cape-free, the better for all concerned.

Lex

Weaknesses

There aren't easy solutions when it comes to Doomsday. Even if we figure out everything there is to know about its previous form, it will soon have evolved past our point of knowledge into something ever more powerful.

Should Doomsday return, we need to be ready. Can we trap it in a multidimensional cage like the Phantom Zone?

If we can learn enough about its sensory input, there's also the possibility of creating an illusory vortex that would [illegible] it to believe it has achieved its goals.

To gain a decisive defeat against Doomsday, weapons should be cultivated that focus on complete obliteration at a molecular level. While humanity doesn't currently have access to such weapons, there are other civilizations that might.

Given that psionics were successful in aiding Superman against Doomsday, it might be beneficial to garner assistance and planning from allies with psi abilities.

As much as it pains me to say, technology can only do so much against a creature like this. I can construct a battle suit that might buy me some time in a fight, but I wouldn't be able to maintain the level of brute force needed to defeat it. As far as we know, it can't be destroyed. I'm considering designs for a time-loop trap, one that would keep Doomsday in an eternal state of transportation using the Justice League's teleportation technology. If we can't destroy it, maybe we can look at ways to imprison it. Evolving matrix force fields, randomized cell destruction, cryogenic stasis. Something new.

No matter how we attempt to cage it, we're going to need someone very powerful around to trade punches with Doomsday until it can be neutralized. At this point, Superman remains our best option for handling confrontations with Doomsday.

KILLER CROC

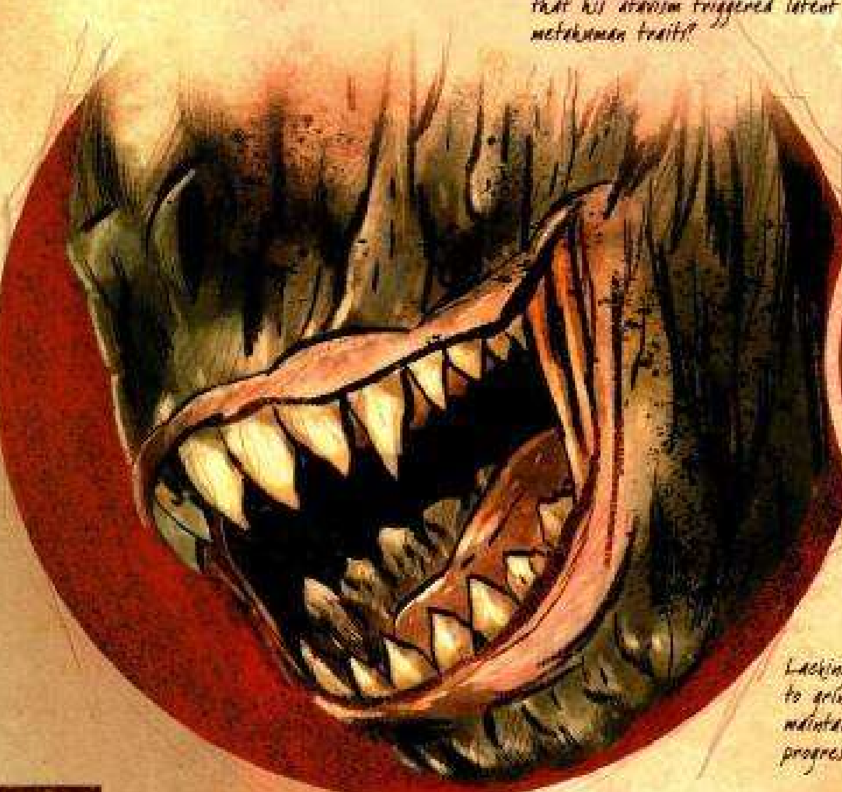
There's no doubt that Waylon Jones displays some unusual physical characteristics, but for all intents and purposes, he probably can't be classified as a true metahuman. While there's been speculation that he is in possession of a metagene that gives him his considerable strength, he's most likely a human with a number of concomitant skin conditions and a degenerative form of atavism. I debated whether to include Waylon in this report, but tracing this atavistic mutation may be relevant in future conflicts.

At this time, Waylon looks like a walking crocodile, but he started life as a human. Atavism is a condition in which vestigial ancestral traits in the DNA become dominant. We all have vestigial traits that have not fully evolved out of our species, such as the appendix or the palmar grasp reflex that human babies lose at about three months but is still essential to primate infants.

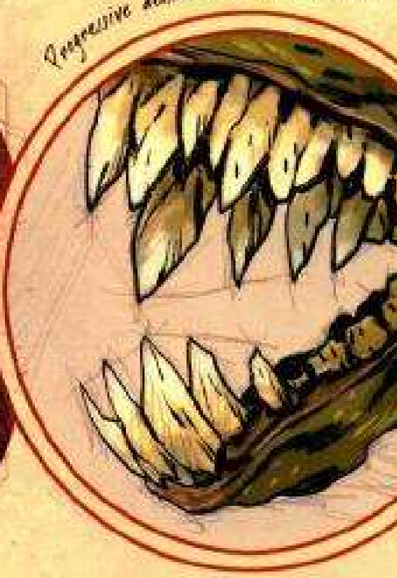
On rare occasions, a person will be born with a trait that is completely unnecessary for the modern human but that still remains in our DNA, a genetic leftover from an earlier point in evolution. As long as the gene remains intact, hidden within our codes, a malfunction in genetic suppression can lead to the gene being expressed. A human with a vestigial tail or an extra nipple can be the result. Theoretically, if the gene is old enough, it can express as a pre-mammalian trait.

In very rare circumstances, a multitude of lost traits come to the surface, traits that are vestigial to humans but may be essential for another species. I believe this to be the case for Killer Croc. Unfortunately for Waylon, the condition appears to be degenerative. Once a career criminal, Killer Croc seems to have devolved into scarcely more than an animal--brutal and deadly.

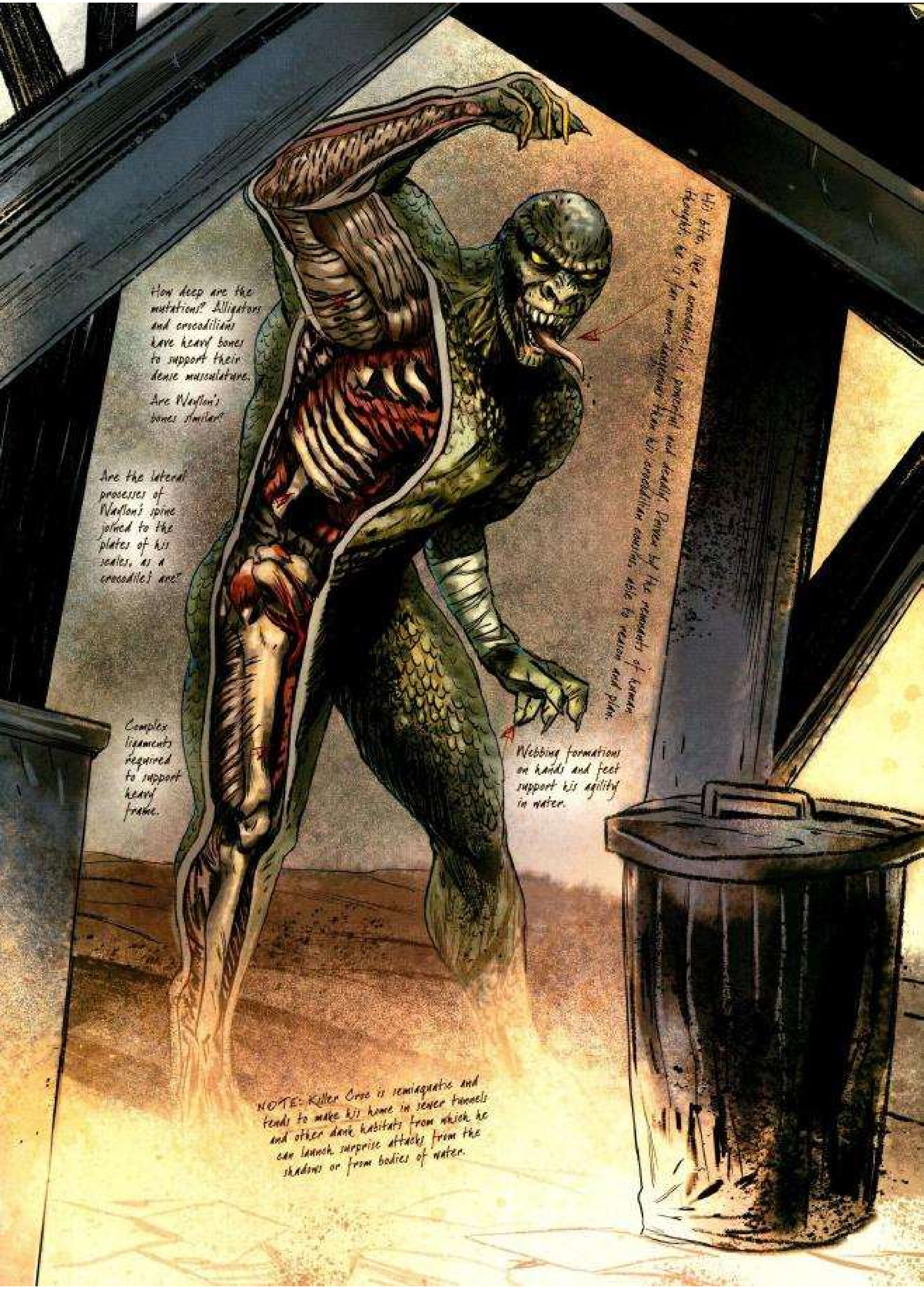
Killer Croc's speed, strength, and aggressiveness are far beyond what a human should possess. Is it possible that his atavism triggered latent metahuman traits?



Progressive dental and oral mutation



Lacking molars, crocodilians swallow rocks to grind their food internally. Croc still maintains human molars, but, as his disorder progresses, that may change.



His bite, like a crocodile's, is powerful and deadly. Driven by the remnants of human thought, he is far more dangerous than his crocodilian cousins: able to reason and plan.

How deep are the mutations? Alligators and crocodilians have heavy bones to support their dense musculature.

Are Waylon's bones similar?

Are the lateral processes of Waylon's spine joined to the plates of his scales, as a crocodile's are?

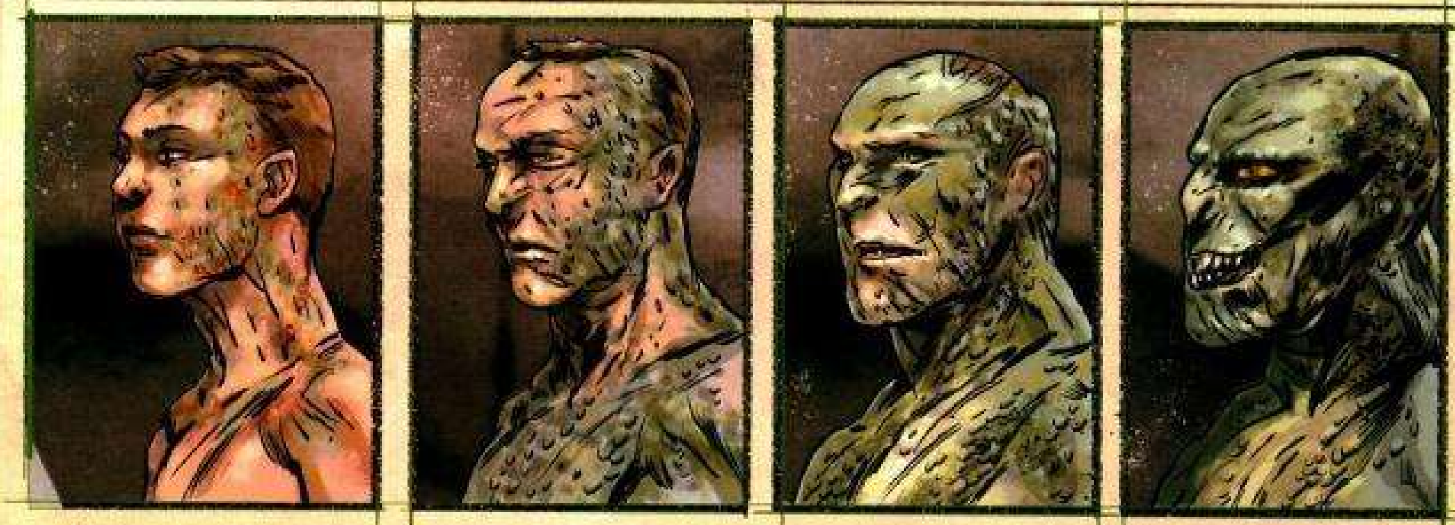
Complex ligaments required to support heavy frame.

Webbing formations on hands and feet support his agility in water.

NOTE: Killer Croc is semiaquatic and tends to make his home in sewer tunnels and other dark habitats from which he can launch surprise attacks from the shadows or from bodies of water.

Skin Condition

When still a child, Waylon started displaying physical symptoms of his disorder. Initially diagnosed with ichthyosis vulgaris (a condition in which build up of the skin's keratin gives it a scaled appearance), Waylon got the nickname Croc early in life. As his condition worsened, there were more diagnoses, none of which adequately explained what was happening to him. Ichthyosis, which keeps one's skin from creating lubricants, will make the skin look tougher than average, but the subdermal tissue won't develop any greater strength. Severe scleroderma would thicken and harden the skin but wouldn't account for his gradual mental deterioration. Epidermolytic hyperkeratosis is often listed as his primary disorder, and that would account for his unpleasant smell, but that diagnosis doesn't explain the "scales."

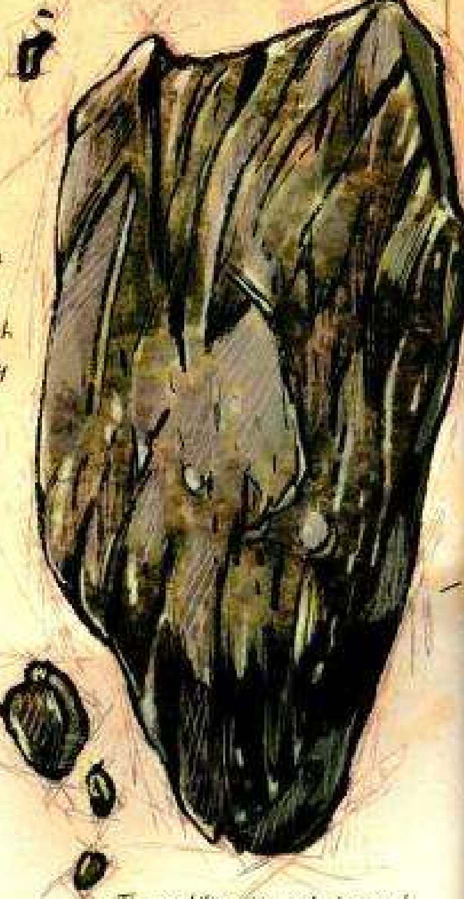


As he grew, Waylon's reptilian traits overtook his human features. The first visible signs were probably patches of rippled or coarse skin around his neck. His skin would have toughened and colored over his first dozen years of life, giving him a scaled appearance. The most significant changes would have taken place at puberty, a gradual restructuring of his musculoskeletal system, his skin taking on an ever more reptilian appearance.

Now that Waylon is an adult, his skeletal system is basically human but with traits one would find in an adult salamander, particularly the shape of his skull and hands. The pattern of his scaling and the set of his teeth are more representative of a crocodile, however. His musculature is overly developed, his jaw is exceptionally wide, and his teeth are painfully sharp. As he ages, his jaw has continued to lengthen and strengthen, giving him a crocodile's powerful bite.

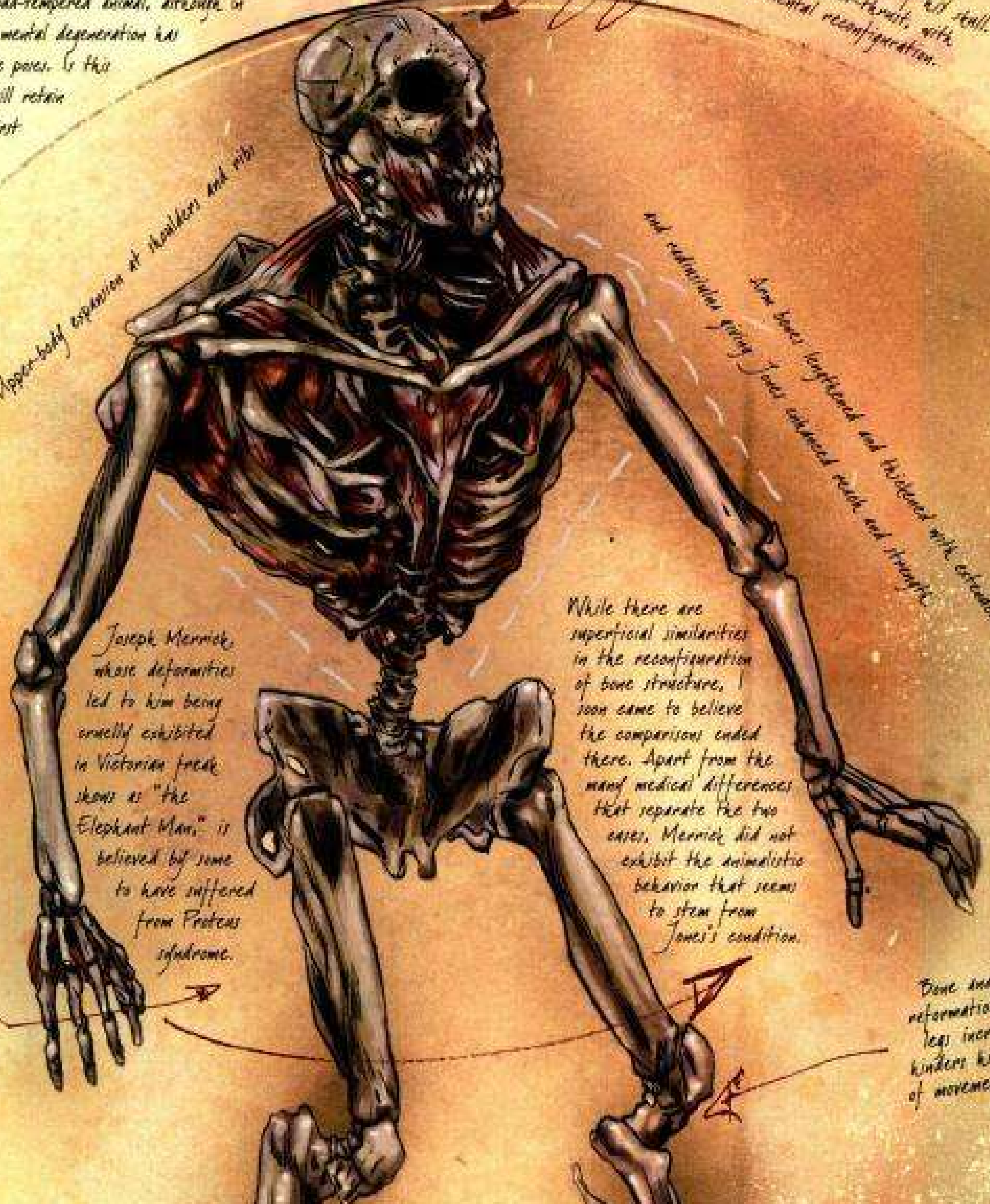
A Nile crocodile's bite has been measured as equivalent to 5,000 pounds of force, strong enough to break bone. Compare that to the bite of a great white shark (3,600 lbf) or a hyena (2,200 lbf), and the need to keep out of Croc's reach becomes obvious. He has developed a crocodile's stiff, bulging jaw muscles, arranged to clamp down with incredible force.

Looking at Killer Croc now, the last vestiges of Waylon Jones seem to be long gone. His head has elongated and flattened and appears fully crocodilian. He has become brutal, even cannibalistic on occasion, his humanity overwhelmed by his mutated primitive instincts.



The reptilian skin and changes to Waylon's physiognomy are merely outward representations of a deeper disorder, one that has irreversibly corrupted his mind.

The medical diagnoses that cover Croc's external physical changes cannot fully explain all that he has become. At the apex of his transformation, he was far more formidable because his cognitive abilities still elevated him above the level of a bad-tempered animal, although in some ways his ongoing mental degeneration has lessened the threat he poses. Is this a ruse? Could Croc still retain the cunning mind he first displayed?



Skeletal changes most obviously apparent in the shape of his skull. Lower jaw is under-thrust, with dramatic dental reconfiguration.

Upper-body expansion at shoulders and ribs

Arm bones lengthened and thickened with extended humerus and radioulnas giving Jones enhanced reach and strength.

Early in my studies I considered that Proteus syndrome, a rare genetic disorder that causes a chronic overgrowth of tissue, could be at the root of Jones's physical abnormalities.

Joseph Merrick, whose deformities led to him being cruelly exhibited in Victorian freak shows as "the Elephant Man," is believed by some to have suffered from Proteus syndrome.

While there are superficial similarities in the reconfiguration of bone structure, I soon came to believe the comparisons ended there. Apart from the many medical differences that separate the two cases, Merrick did not exhibit the animalistic behavior that seems to stem from Jones's condition.

Bone and joint reformation of the legs increasingly hinders his freedom of movement on land.

Dermal scaling toughens the outer skin cells, giving only the appearance of scales on normal skin, but Croc's current incarnation is actually scaled. Overlapping plates of alpha and beta keratin cover his entire body.

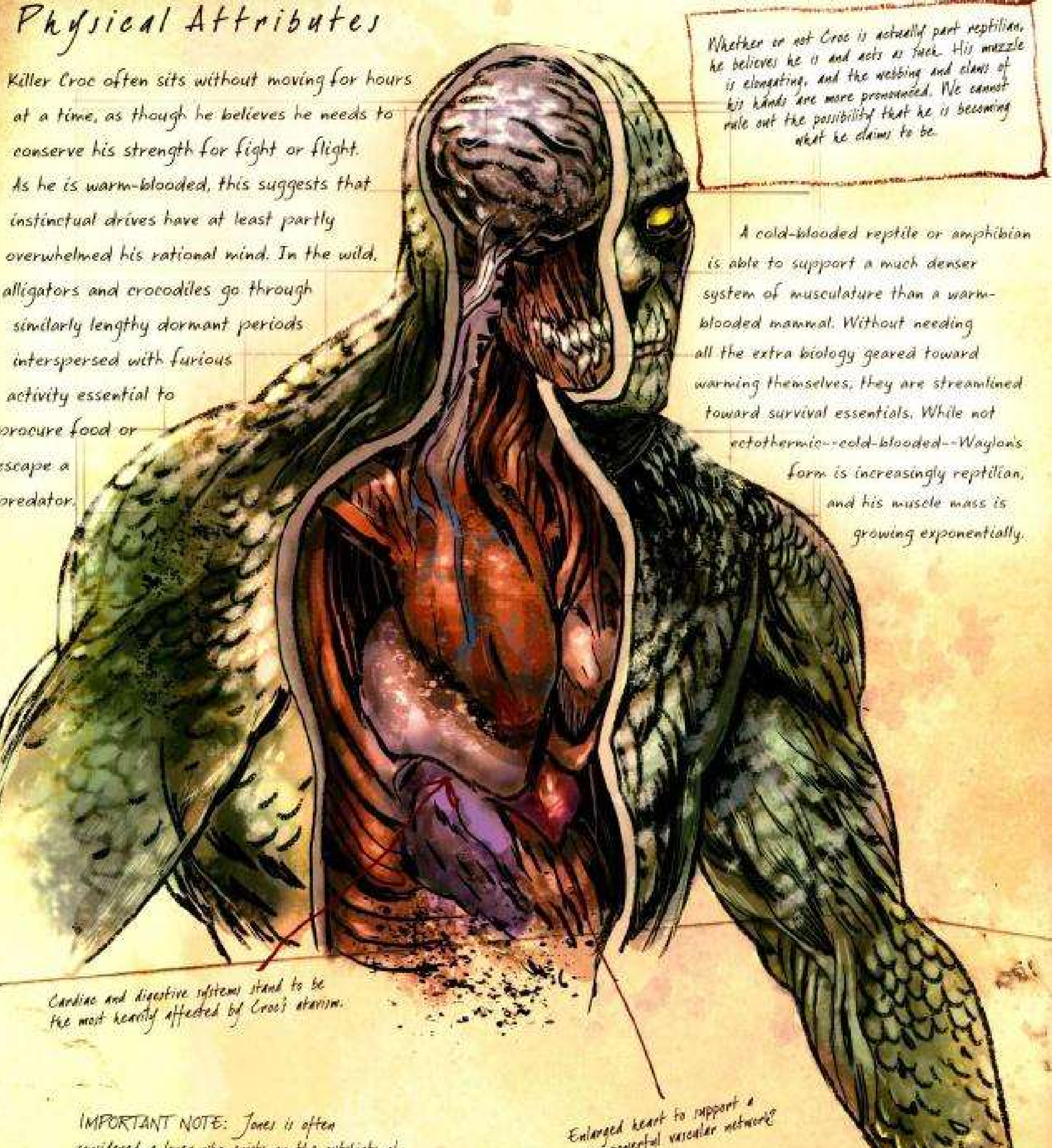
NOTE: Carry out comparative study regarding Jones's speed on land versus water.

Physical Attributes

Killer Croc often sits without moving for hours at a time, as though he believes he needs to conserve his strength for fight or flight. As he is warm-blooded, this suggests that instinctual drives have at least partly overwhelmed his rational mind. In the wild, alligators and crocodiles go through similarly lengthy dormant periods interspersed with furious activity essential to procure food or escape a predator.

Whether or not Croc is actually part reptilian, he believes he is and acts as such. His muzzle is elongating, and the webbing and claws of his hands are more pronounced. We cannot rule out the possibility that he is becoming what he claims to be.

A cold-blooded reptile or amphibian is able to support a much denser system of musculature than a warm-blooded mammal. Without needing all the extra biology geared toward warming themselves, they are streamlined toward survival essentials. While not ectothermic--cold-blooded--Waylon's form is increasingly reptilian, and his muscle mass is growing exponentially.



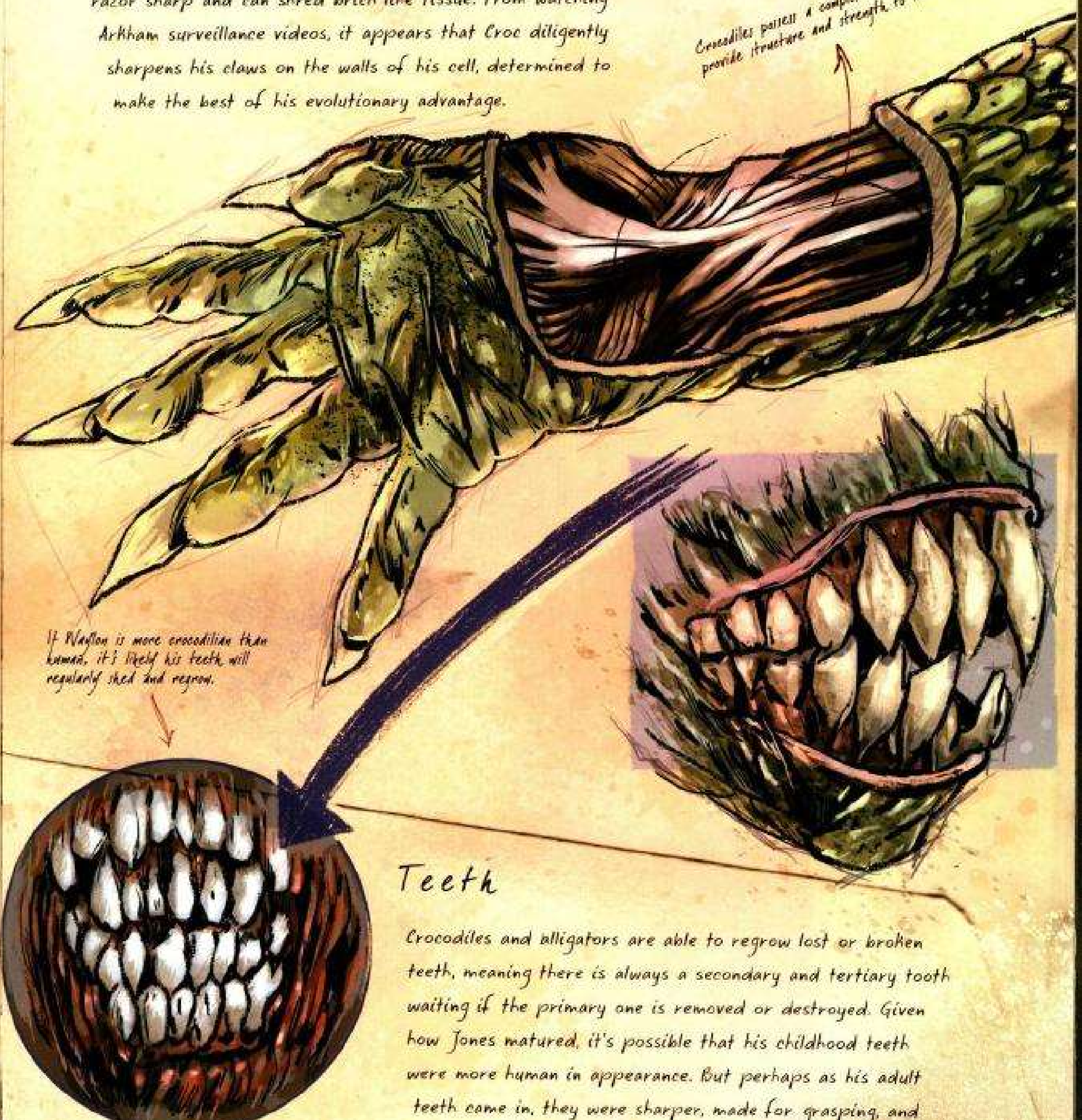
Cardiac and digestive systems stand to be the most heavily affected by Croc's atavism.

Enlarged heart to support a more powerful vascular network?

IMPORTANT NOTE: Jones is often considered a loner who exists on the outskirts of society, preying on those unfortunate enough to cross his path. While this is certainly true, it's important to state that he also has a history of teaming with other outlaws, most notably as part of government operative Amanda Waller's Task Force X, aka Suicide Squad. He's also been associated with a range of other super-villains including Selina Kyle, Poison Ivy, and the Scarecrow, and is even rumored to have formed a romantic attachment to June Moone, human host to Enchantress. While these partnerships can be volatile--as is the case with any criminal association--he is fully capable of working as part of a social unit . . . that is, until his bestial nature gets the better of him.

Hands

Croc's fingers are webbed and clawed but have maintained a humanoid structure, with an opposable thumb. The claws are razor sharp and can shred brick like tissue. From watching Arkham surveillance videos, it appears that Croc diligently sharpens his claws on the walls of his cell, determined to make the best of his evolutionary advantage.

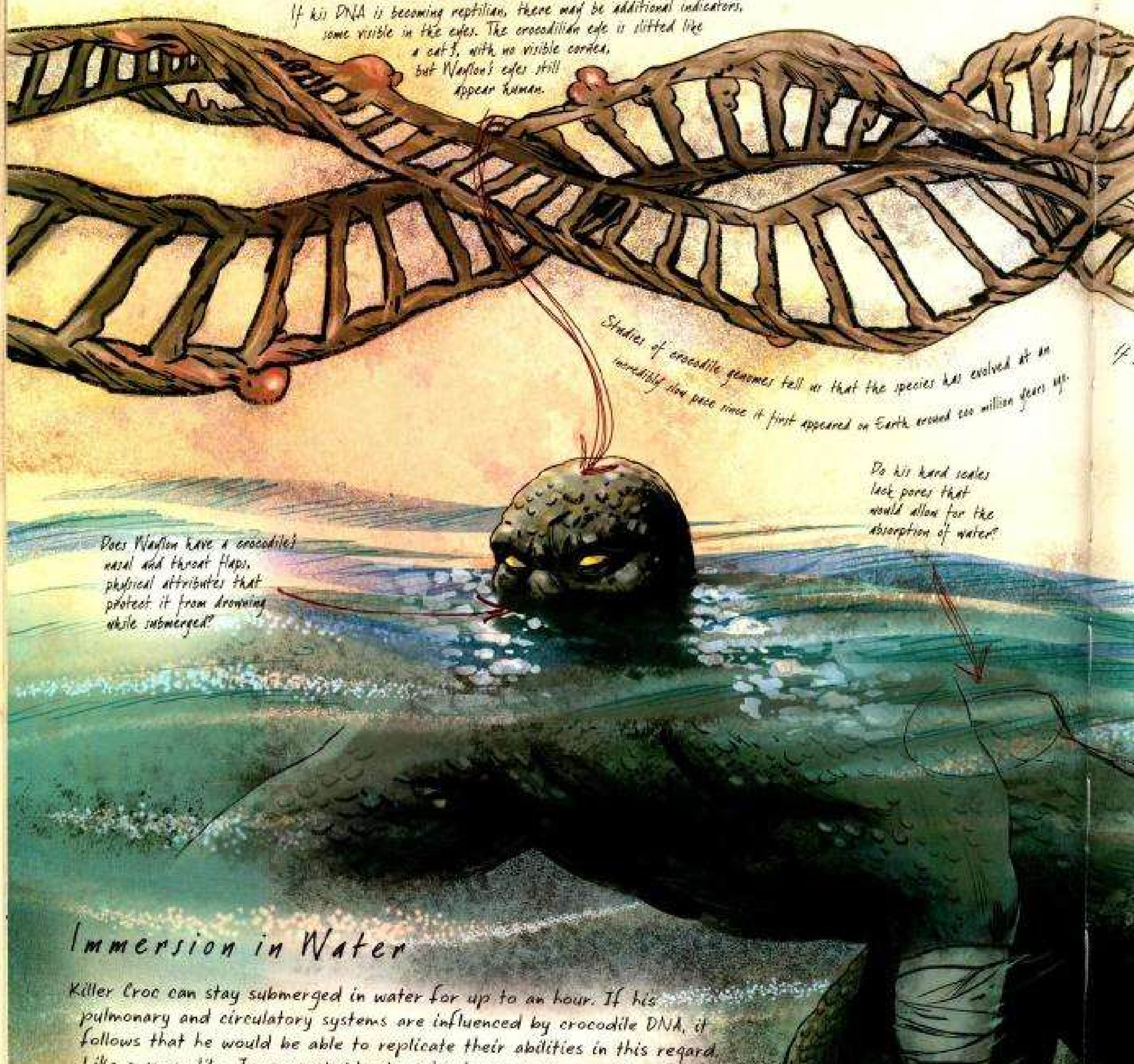


Crocodiles possess a complex web of ligaments that provide structure and strength to limbs.

If Waylon is more crocodilian than human, it's likely his teeth will regularly shed and regrow.

Teeth

Crocodiles and alligators are able to regrow lost or broken teeth, meaning there is always a secondary and tertiary tooth waiting if the primary one is removed or destroyed. Given how Jones matured, it's possible that his childhood teeth were more human in appearance. But perhaps as his adult teeth came in, they were sharper, made for grasping, and spaced differently. As he has continued to devolve, Jones has developed the interlocking teeth of a true crocodile.



If his DNA is becoming reptilian, there may be additional indicators, some visible in the eyes. The crocodilian eye is slitted like a cat's, with no visible cornea, but Waylon's eyes still appear human.

Studies of crocodile genomes tell us that the species has evolved at an incredibly slow pace since it first appeared on Earth around 200 million years ago.

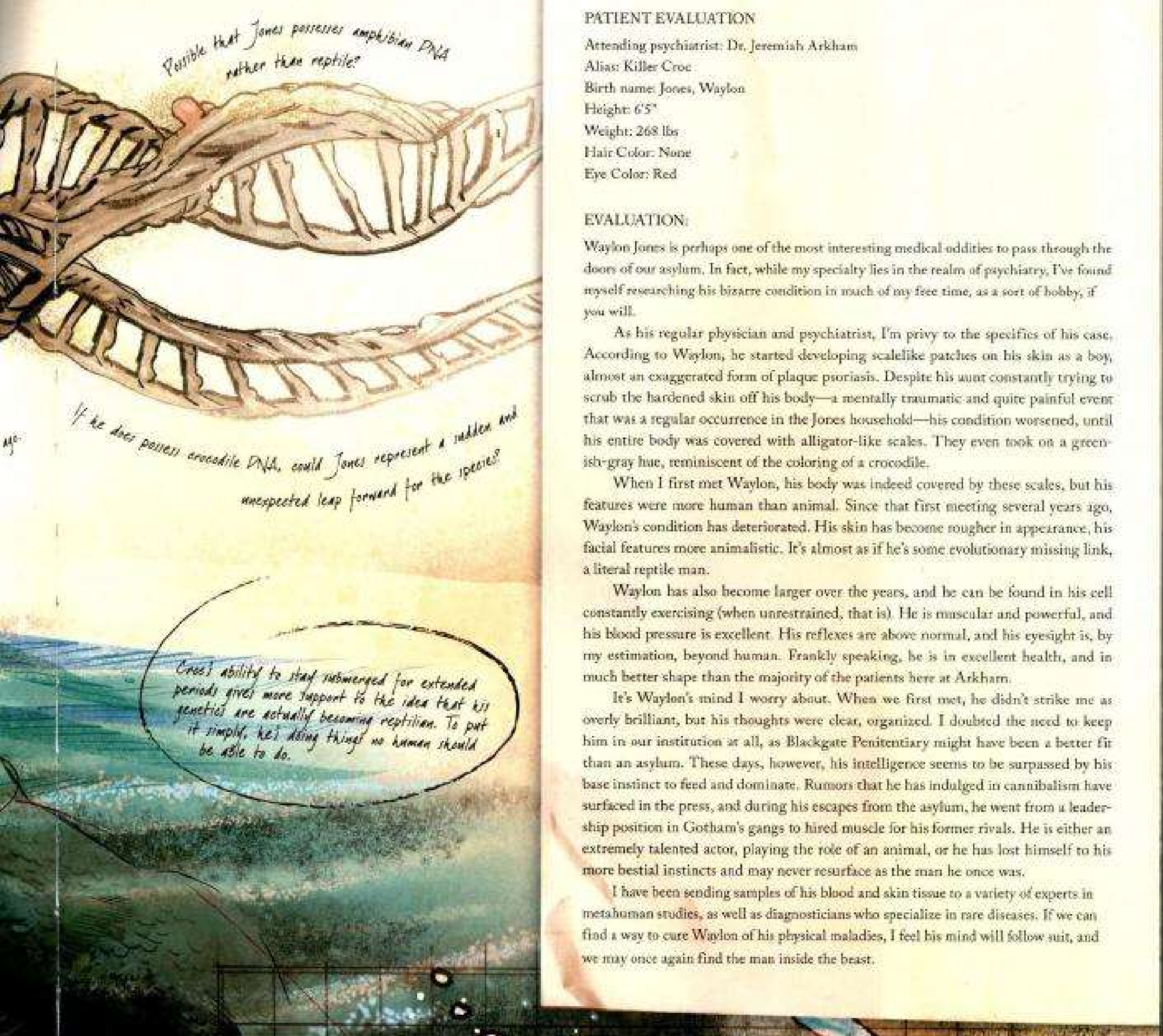
If

Do his hard scales lack pores that would allow for the absorption of water?

Does Waylon have a crocodile's nasal and throat flaps, physical attributes that protect it from drowning while submerged?

Immersion in Water

Killer Croc can stay submerged in water for up to an hour. If his pulmonary and circulatory systems are influenced by crocodile DNA, it follows that he would be able to replicate their abilities in this regard. Like a crocodile, Jones probably slows his heart to two or three beats per minute to conserve oxygen. If this is indeed how he can stay submerged for such long periods, he would need to remain inactive while underwater. Activity will use oxygen regardless of heart rate. Another possibility is that an amphibious atavistic trait allows him to breathe through a process called cutaneous respiration, a form of respiration common in a number of organisms, including frogs. It's not impossible, given all his other atavistic mutations, to believe that the skin beneath Killer Croc's scales is gas permeable and, like a frog or certain fish, he can absorb liquid oxygen through his skin. This ability could greatly lengthen his submersion time.



Possible that Jones possesses amphibian DNA rather than reptile?

If he does possess crocodile DNA, could Jones represent a sudden and unexpected leap forward for the species?

age.

Croc's ability to stay submerged for extended periods gives more support to the idea that his genetics are actually becoming reptilian. To put it simply, he's doing things no human should be able to do.

PATIENT EVALUATION

Attending psychiatrist: Dr. Jeremiah Arkham
Alias: Killer Croc
Birth name: Jones, Waylon
Height: 6'5"
Weight: 268 lbs
Hair Color: None
Eye Color: Red

EVALUATION:

Waylon Jones is perhaps one of the most interesting medical oddities to pass through the doors of our asylum. In fact, while my specialty lies in the realm of psychiatry, I've found myself researching his bizarre condition in much of my free time, as a sort of hobby, if you will.

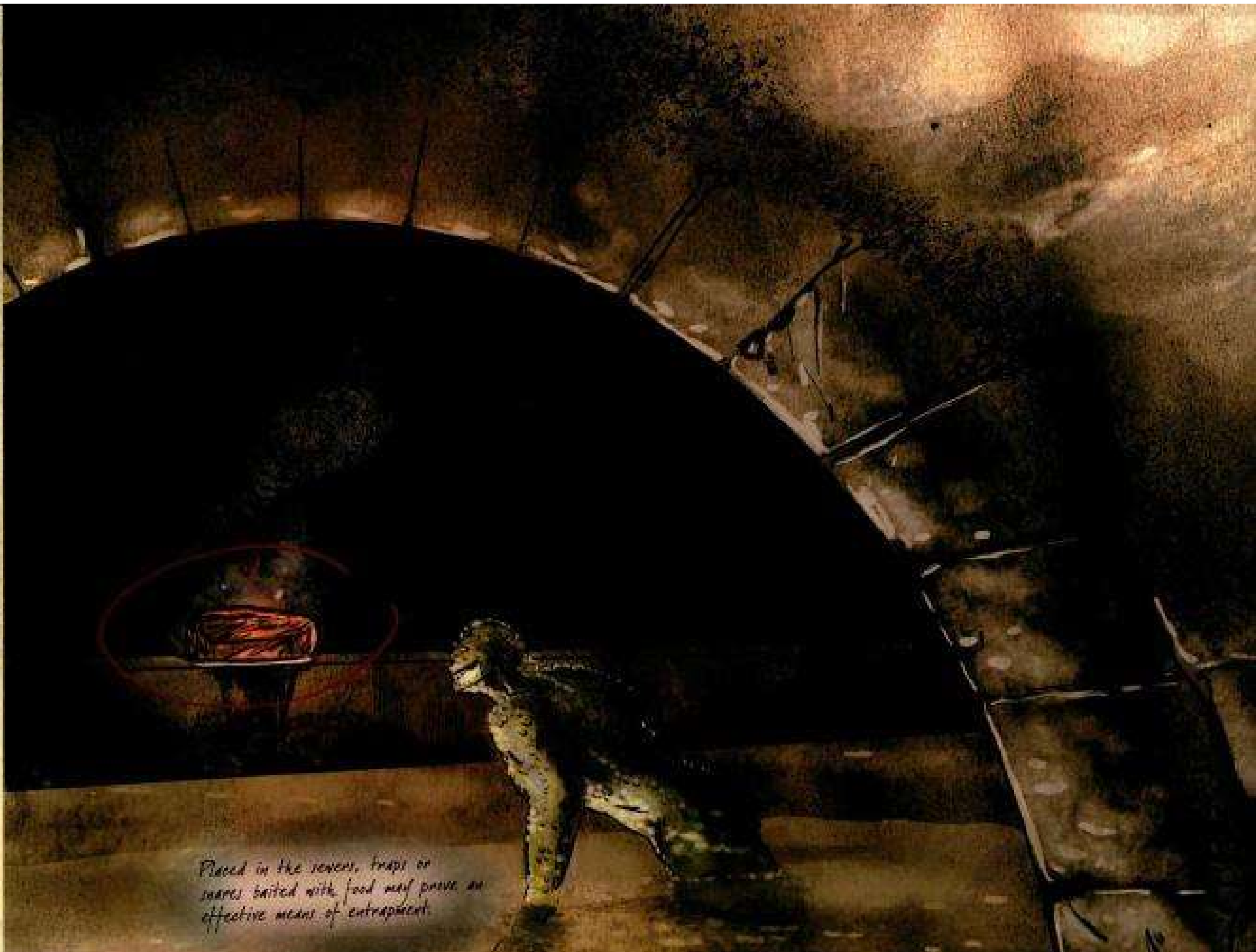
As his regular physician and psychiatrist, I'm privy to the specifics of his case. According to Waylon, he started developing scalelike patches on his skin as a boy, almost an exaggerated form of plaque psoriasis. Despite his aunt constantly trying to scrub the hardened skin off his body—a mentally traumatic and quite painful event that was a regular occurrence in the Jones household—his condition worsened, until his entire body was covered with alligator-like scales. They even took on a greenish-gray hue, reminiscent of the coloring of a crocodile.

When I first met Waylon, his body was indeed covered by these scales, but his features were more human than animal. Since that first meeting several years ago, Waylon's condition has deteriorated. His skin has become rougher in appearance, his facial features more animalistic. It's almost as if he's some evolutionary missing link, a literal reptile man.

Waylon has also become larger over the years, and he can be found in his cell constantly exercising (when unrestrained, that is). He is muscular and powerful, and his blood pressure is excellent. His reflexes are above normal, and his eyesight is, by my estimation, beyond human. Frankly speaking, he is in excellent health, and in much better shape than the majority of the patients here at Arkham.

It's Waylon's mind I worry about. When we first met, he didn't strike me as overly brilliant, but his thoughts were clear, organized. I doubted the need to keep him in our institution at all, as Blackgate Penitentiary might have been a better fit than an asylum. These days, however, his intelligence seems to be surpassed by his base instinct to feed and dominate. Rumors that he has indulged in cannibalism have surfaced in the press, and during his escapes from the asylum, he went from a leadership position in Gotham's gangs to hired muscle for his former rivals. He is either an extremely talented actor, playing the role of an animal, or he has lost himself to his more bestial instincts and may never resurface as the man he once was.

I have been sending samples of his blood and skin tissue to a variety of experts in metahuman studies, as well as diagnosticians who specialize in rare diseases. If we can find a way to cure Waylon of his physical maladies, I feel his mind will follow suit, and we may once again find the man inside the beast.



Placed in the sewers, traps or snares baited with food may prove an effective means of entrapment.

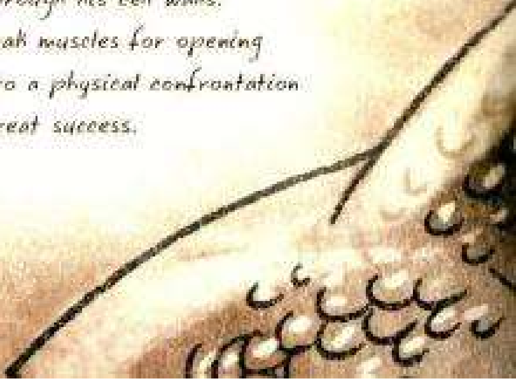
Weaknesses

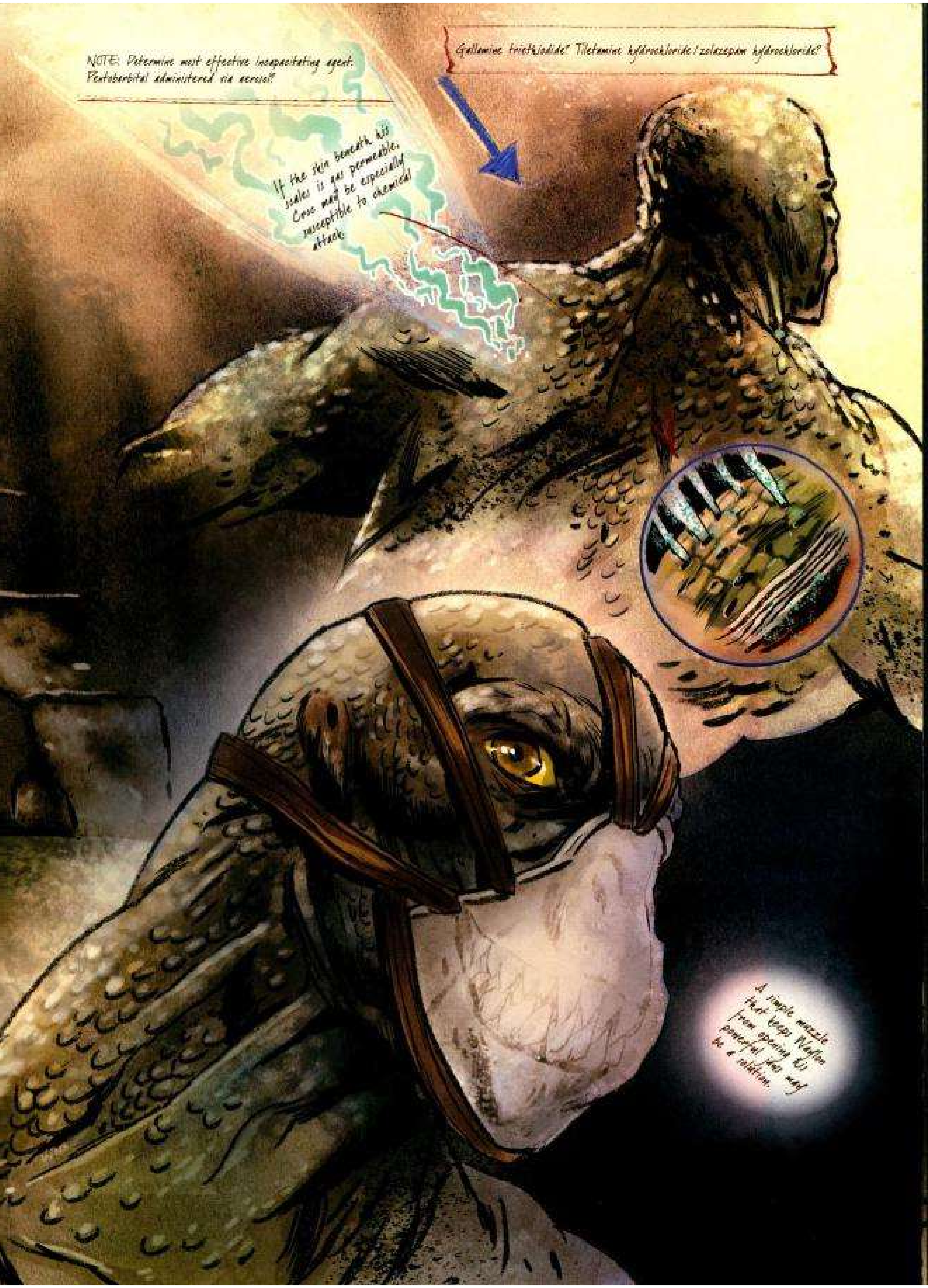
Killer Croc has certainly changed over the years I've known him. Where once he exhibited cunning and even wit, his modus operandi now is brutal strength and near-mindless cruelty. While his ferocity is certainly a cause for concern, his diminished intelligence has made tricking and trapping him less difficult. Setting a food-baited trap in the sewers might prove as effective as any more complicated plan. Still, overconfidence could prove fatal. Killing means nothing to him, an idea that is important to keep in mind during any encounter with Croc.

Another of Croc's potential weaknesses comes into play only if my theory about gas-permeable skin is correct. Skin permeability is not something that can be controlled, like holding your breath. His skin would always be permeable. If that's the case, Killer Croc would be exceptionally vulnerable to any sort of gas attack as long as the effective molecules within the gas are small enough to pass through his cell walls.

Additionally, crocodiles can bite down with tremendous force but have small, weak muscles for opening their jaws. Their mouths can be held closed with a strong rubber band. If forced into a physical confrontation with Waylon, binding his jaws closed is an obvious first tactic that I've used with great success.

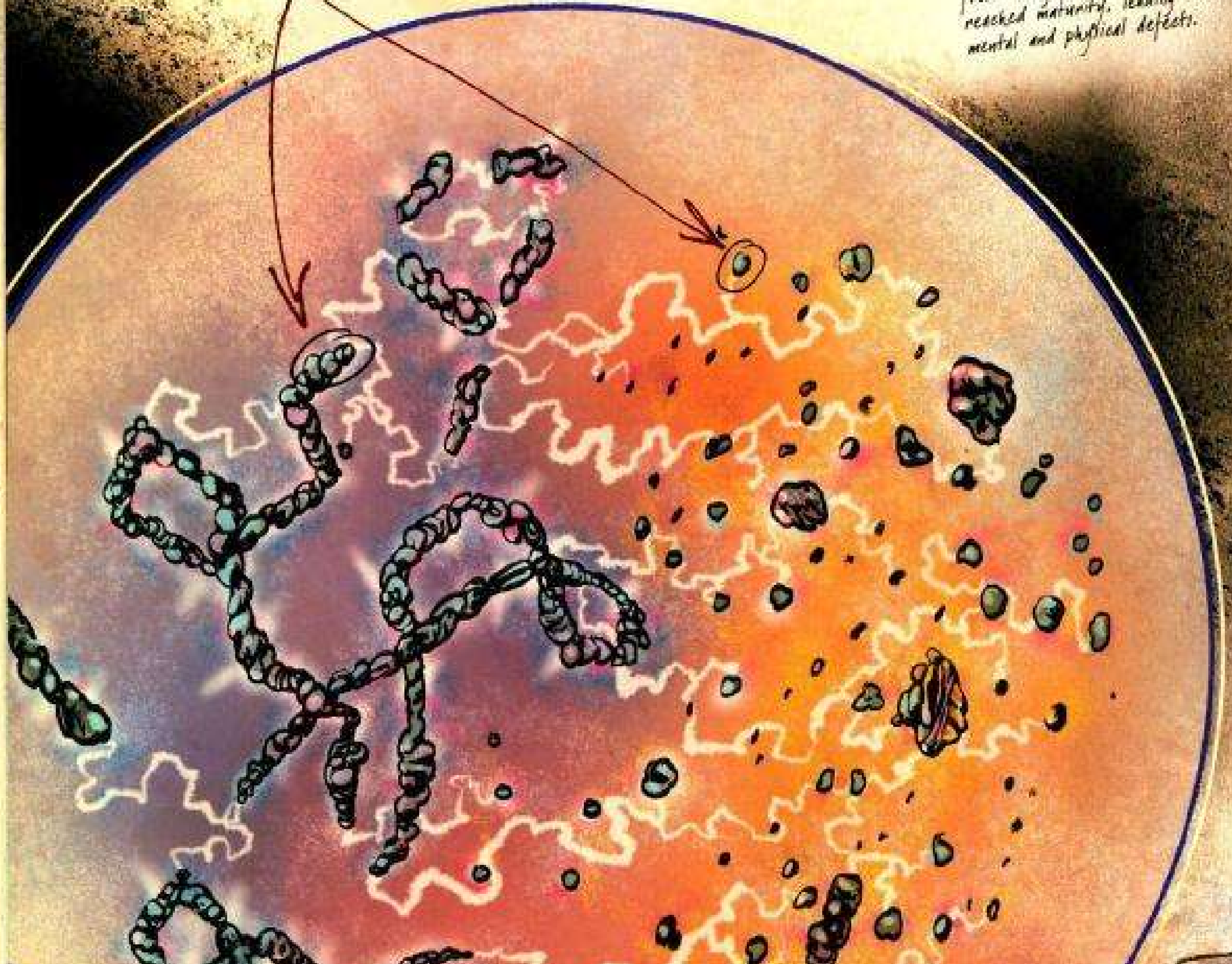
Jones was once tricked by Bane into ingesting Venom. While he doesn't seem to have continued use of the drug, I will monitor his physiology and behavior for signs of possible side effects.




NOTE: Determine most effective incapacitating agent. Pentobarbital administered via aerosol?
Gallamine triethiodide? Tiletamine hydrochloride/zolazepam hydrochloride?
If the skin beneath his scales is gas permeable, Croc may be especially susceptible to chemical attack.
A simple muzzle that keeps Waylon from opening his powerful jaws may be a solution.

BIZARRO

Through an accelerated cloning process, Lex Luthor grew his own genetically engineered Kryptonian being using DNA collected from Superman. Released too early from the process, the result was a semi-intelligent, super-powerful creature that answered Luthor's every command. Naming itself after the designation on its cloning chamber--B-Zero--Bizarro exhibited many of Superman's strengths but without Clark's self-control or intellect to guide his actions.

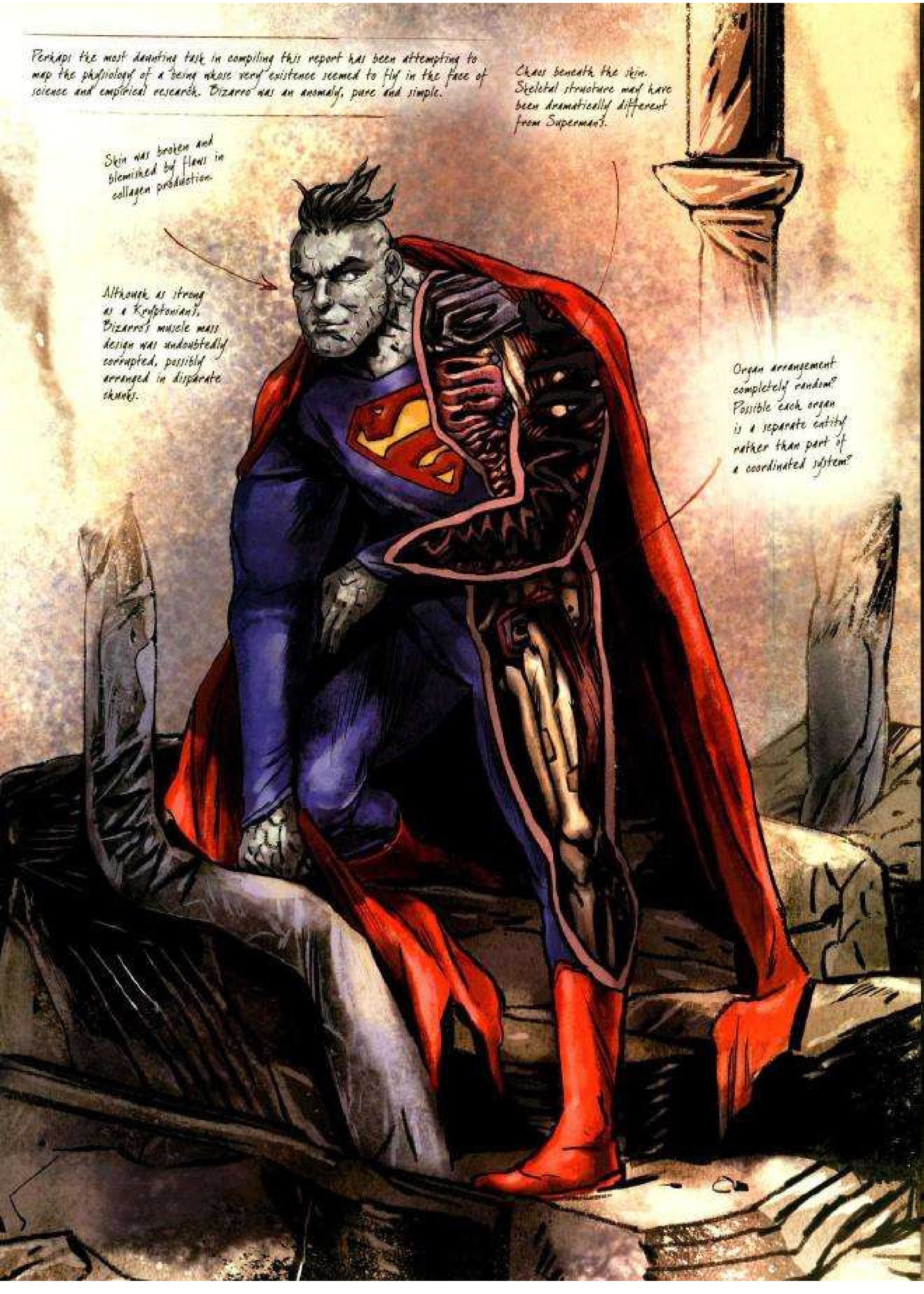


DNA degraded, chains broken. Genetic tampering at its sloppiest.

Because Bizarro was cloned from Superman's DNA, the best template for studying this creature is Superman himself.

The original Bizarro was released from the growth process before he'd reached maturity, leading to severe mental and physical defects.

Perhaps the most daunting task in compiling this report has been attempting to map the physiology of a being whose very existence seemed to fly in the face of science and empirical research. Bizarro was an anomaly, pure and simple.

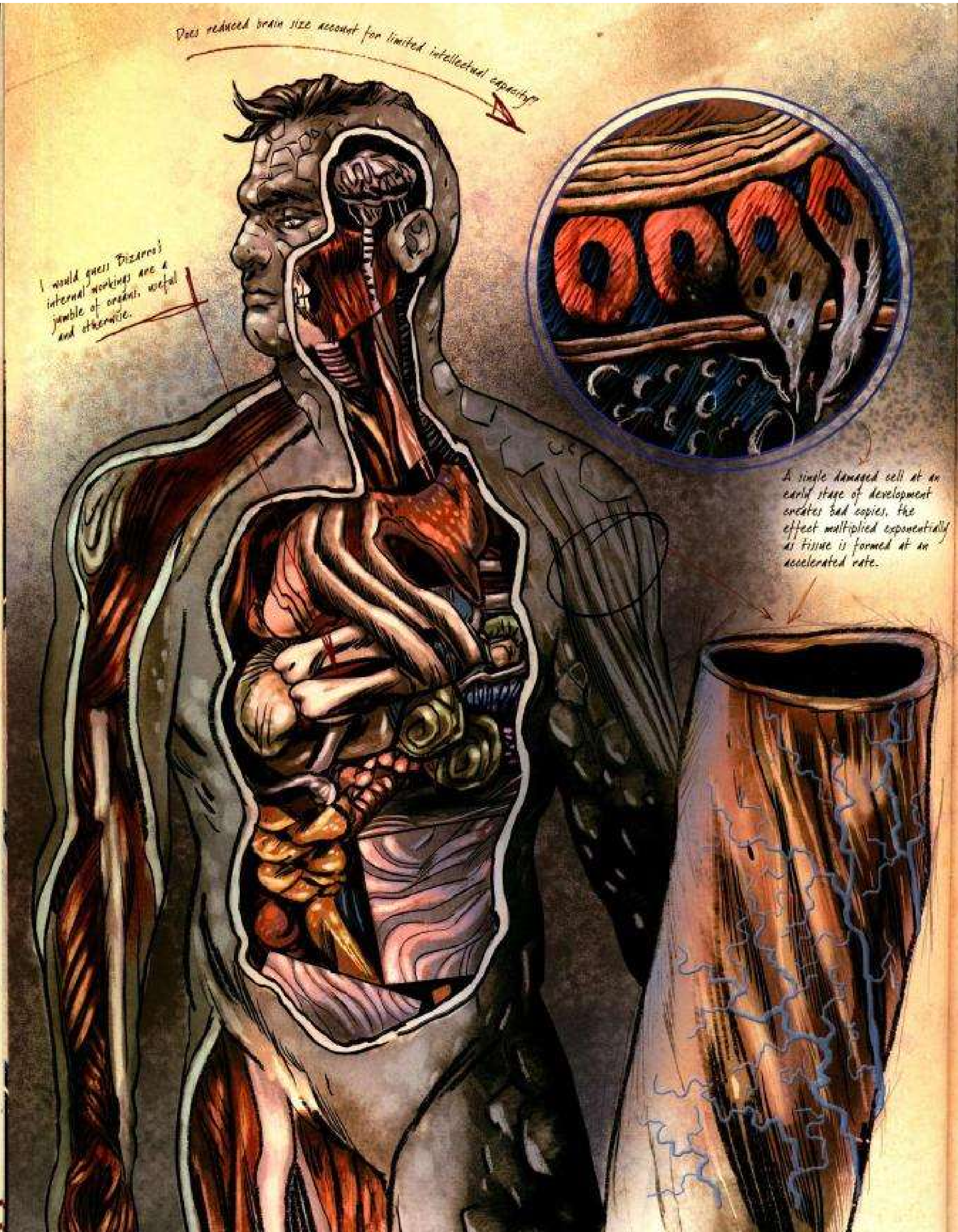


Chaos beneath the skin. Skeletal structure may have been dramatically different from Superman's.

Skin was broken and blemished by flaws in collagen production.

Although as strong as a Kryptonian, Bizarro's muscle mass design was undoubtedly corrupted, possibly arranged in disparate chunks.

Organ arrangement completely random? Possible each organ is a separate entity rather than part of a coordinated system?

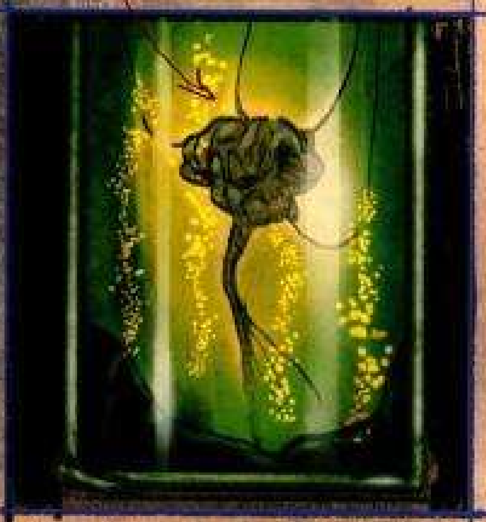


Does reduced brain size account for limited intellectual capacity?

I would guess Bizarro's internal workings are a jumble of organs, useful and otherwise.

A single damaged cell at an early stage of development creates bad copies, the effect multiplied exponentially as tissue is formed at an accelerated rate.

Development



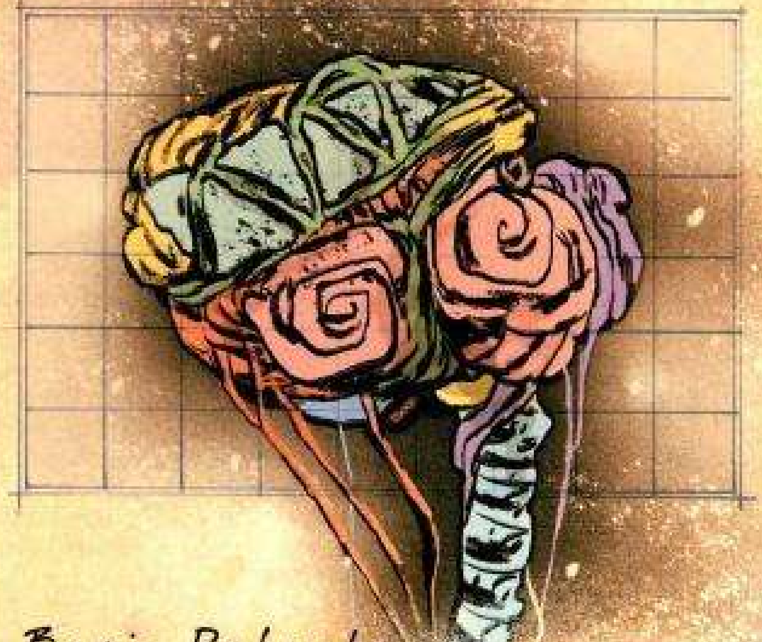
Parts of Bizarro's brain were no doubt extremely underdeveloped. Were original samples damaged, or was Lex Luthor's bad foundational science entirely to blame?

As usual, Lex Luthor used science like a sledgehammer, employing a fast and poorly tested development method to grow his Superman clone. Not a patient man, Luthor expected results in ten years. There's a good chance that even if Bizarro had grown for the requisite decade, he still would have suffered a number of organic defects due to the speed of the process. Removed from his growth chamber five years too early, it's remarkable that he could function at all.

In a laboratory, embryonic cell division and replication must be achieved in a slow, methodical process, in order to decrease the chance of errors. Efficient cell division is especially critical for stem cells, the cell "blanks" that give rise to different types of cells, creating differentiation. If the first bone cell created in a gestating being has an error, it can lead to systemic bone defects. Likewise, a single skin cell mistake can be the eventual cause of melanoma.

Human fetal development starts with the critical systems first--heart, brain, spinal cord. Development of the bodily systems continues throughout gestation with all the finer processes occurring at the end. This means that the prematurely born child has a chance for basic survival but can experience other complications, mostly related to lung and brain development. Proper growth takes time.

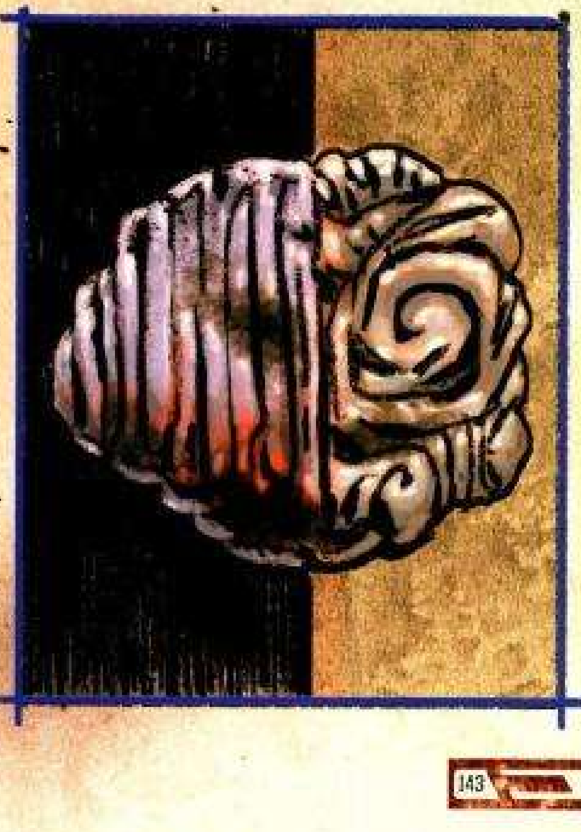
In Bizarro, Luthor tried to skip the details, altering genetic markers without considering the new errors he was creating. The placement of Bizarro's viscera and heart were apparently reversed (situs inversus totalis and dextrocardia, respectively), and while his body had advanced to Superman size and strength, his brain was still extremely underdeveloped. Physically, he had a number of Superman's abilities--super-strength and super-speed, flight, stamina, and durability--but there were reversals. Bizarro had flame breath and freeze vision, for example.

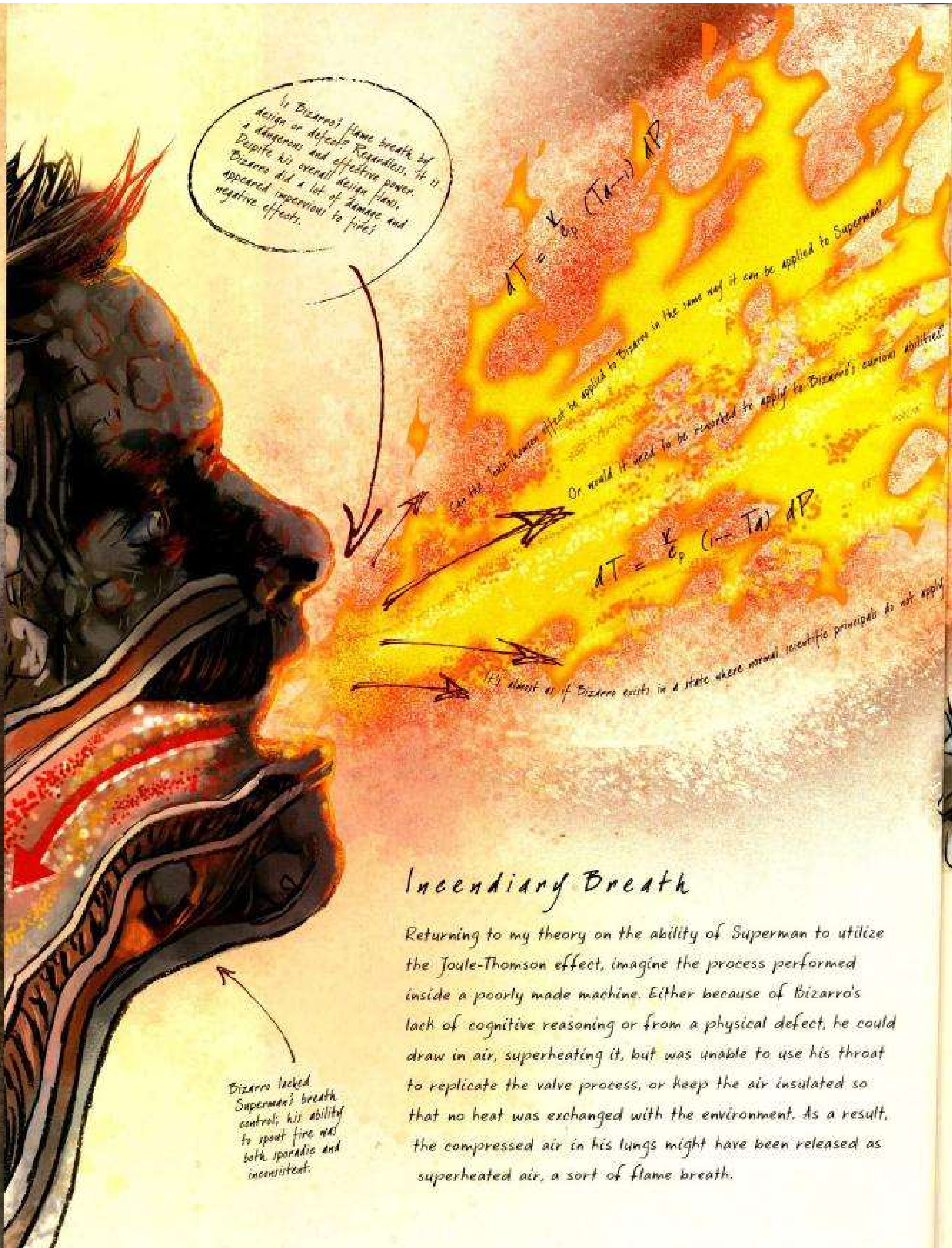


Brain Defects

According to notes lifted from Lex Luthor's private lab reports, Bizarro suffered from insufficient cerebro-neural development. It seems that neural cells cannot be rushed through development. Bizarro's emotional limbic system, hippocampus, and amygdala were all underdeveloped, giving him a high propensity for aggression and no real sense of action and consequence, right and wrong. His frontal lobe also didn't function properly, giving him poor impulse control and a childlike fear of the dark. His Broca's area--or rather the Kryptonian equivalent of the part of the brain that controls speech--was obviously also immature, as he could barely string two words together.

I don't believe Lex took into account that a child's brain learns better than an adult's. It seems likely that he thought an adult Kryptonian would automatically educate itself through sensory exposure, not considering that Bizarro lacked a child's flexible learning abilities.





Is Bizarro's flame breath by design or defect? Regardless, it is a dangerous and effective power. Despite his overall design flaws, Bizarro did a lot of damage and appeared impervious to fire's negative effects.

$$\Delta T = \frac{V}{C_p}(T\alpha - 1)\,\Delta P$$

Can the Joule-Thomson effect be applied to Bizarro in the same way it can be applied to Superman?

Or would it need to be reworked to apply to Bizarro's curious abilities?

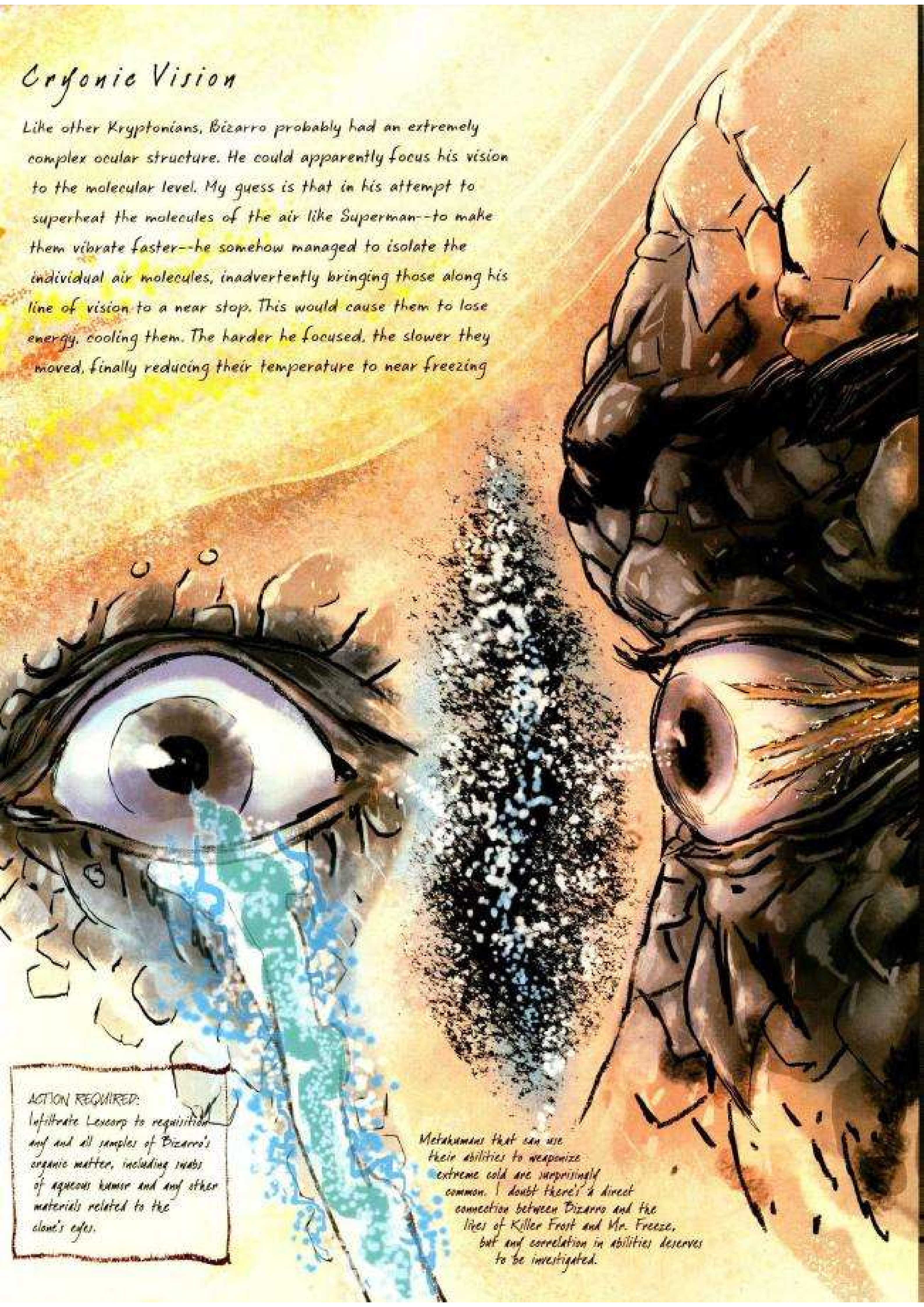
$$\Delta T = \frac{V}{C_p}(1 - T\alpha)\,\Delta P$$

It's almost as if Bizarro exists in a state where normal scientific principals do not apply

Bizarro lacked Superman's breath control; his ability to spout fire was both sporadic and inconsistent.

Incendiary Breath

Returning to my theory on the ability of Superman to utilize the Joule-Thomson effect, imagine the process performed inside a poorly made machine. Either because of Bizarro's lack of cognitive reasoning or from a physical defect, he could draw in air, superheating it, but was unable to use his throat to replicate the valve process, or keep the air insulated so that no heat was exchanged with the environment. As a result, the compressed air in his lungs might have been released as superheated air, a sort of flame breath.



Cryonic Vision

Like other Kryptonians, Bizarro probably had an extremely complex ocular structure. He could apparently focus his vision to the molecular level. My guess is that in his attempt to superheat the molecules of the air like Superman--to make them vibrate faster--he somehow managed to isolate the individual air molecules, inadvertently bringing those along his line of vision to a near stop. This would cause them to lose energy, cooling them. The harder he focused, the slower they moved, finally reducing their temperature to near freezing

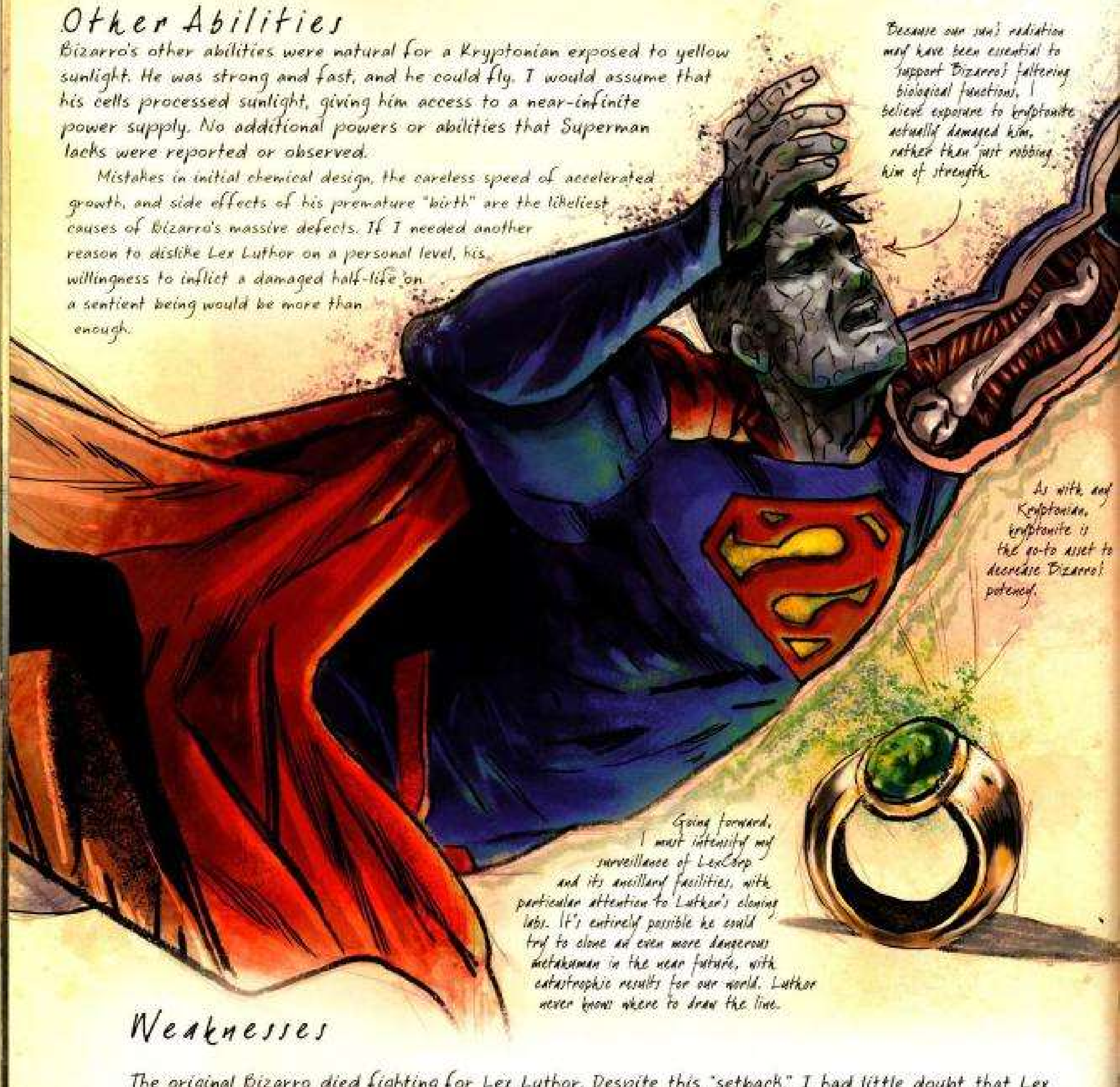
ACTION REQUIRED:
Infiltrate Lexcorp to requisition any and all samples of Bizarro's organic matter, including swabs of aqueous humor and any other materials related to the clone's eyes.

Metahumans that can use their abilities to weaponize extreme cold are surprisingly common. I doubt there's a direct connection between Bizarro and the likes of Killer Frost and Mr. Freeze, but any correlation in abilities deserves to be investigated.

Other Abilities

Bizarro's other abilities were natural for a Kryptonian exposed to yellow sunlight. He was strong and fast, and he could fly. I would assume that his cells processed sunlight, giving him access to a near-infinite power supply. No additional powers or abilities that Superman lacks were reported or observed.

Mistakes in initial chemical design, the careless speed of accelerated growth, and side effects of his premature "birth" are the likeliest causes of Bizarro's massive defects. If I needed another reason to dislike Lex Luthor on a personal level, his willingness to inflict a damaged half-life on a sentient being would be more than enough.



Because our sun's radiation may have been essential to support Bizarro's faltering biological functions, I believe exposure to kryptonite actually damaged him, rather than just robbing him of strength.

As with any Kryptonian, kryptonite is the go-to asset to decrease Bizarro's potency.

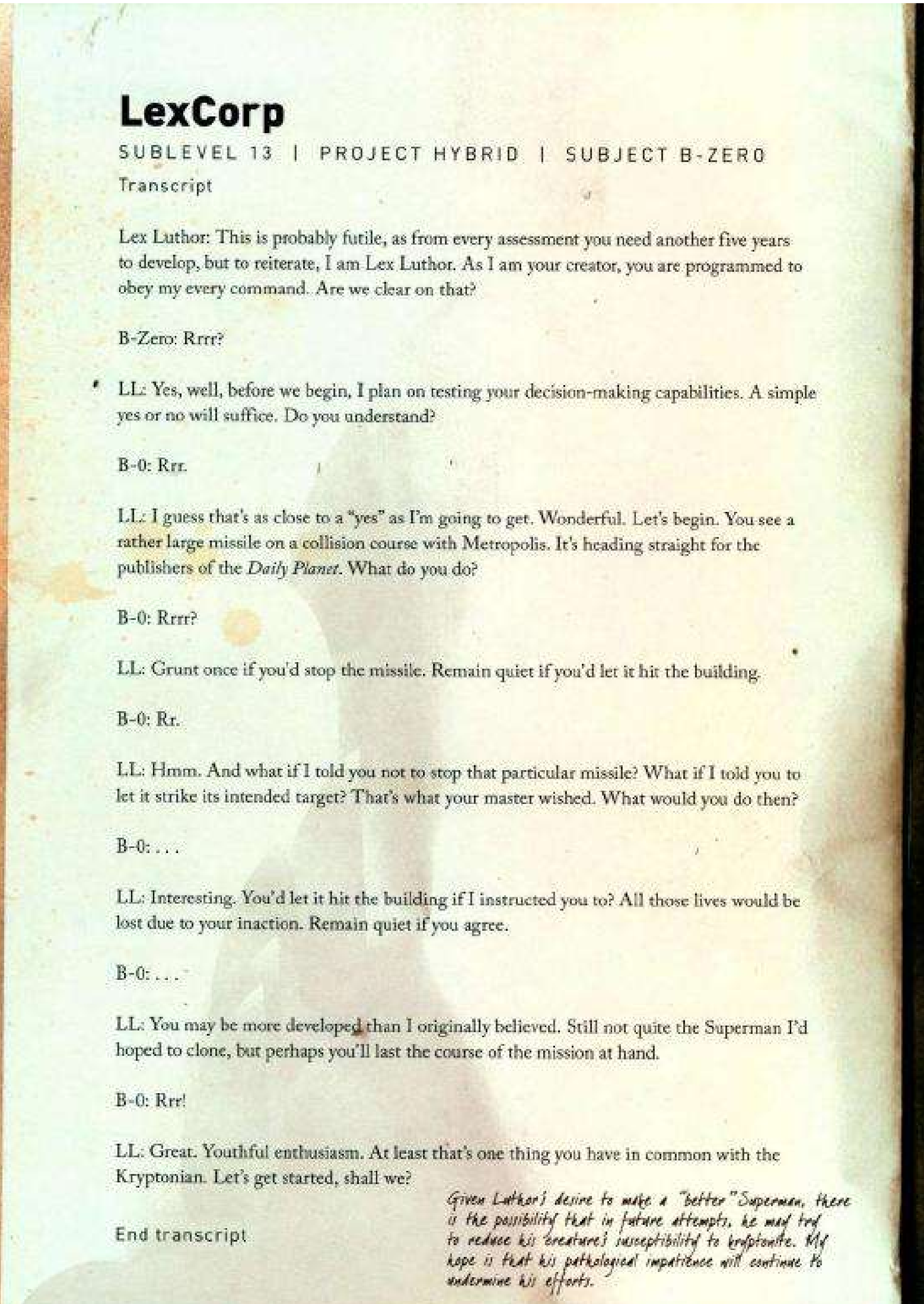
Going forward, I must intensify my surveillance of LexCorp and its ancillary facilities, with particular attention to Luthor's cloning labs. It's entirely possible he could try to clone an even more dangerous metahuman in the near future, with catastrophic results for our world. Luthor never knows where to draw the line.

Weaknesses

The original Bizarro died fighting for Lex Luthor. Despite this "setback," I had little doubt that Lex was still interested in this particular project, and expected more of his attempts to clone Superman in the future. As it turned out, I was correct.

While working undercover to subvert the crime boss known as Black Mask, Red Hood stumbled upon another Superman clone. Red Hood befriended this powerful new Bizarro, and the two are currently working together, alongside an Amazon named Artemis. While Red Hood and I don't always see eye to eye, we still compare notes from time to time. I'm hoping his new association will allow me access to data I wasn't privy to with the earlier Bizarro incarnation.

If things go badly, and we do have to face Bizarro in battle again, many of the precautions taken against Superman should work just as effectively against his clone. While in some ways "backwards," any incarnation of Bizarro is still Kryptonian. During my brief bout with Luthor's original clone, Bizarro proved susceptible to my kryptonite ring. It follows that the new Bizarro would be likewise impacted by kryptonite, and could be just as vulnerable as Superman to certain kinds of red sun-radiation.



LexCorp

SUBLEVEL 13 | PROJECT HYBRID | SUBJECT B-ZERO

Transcript

Lex Luthor: This is probably futile, as from every assessment you need another five years to develop, but to reiterate, I am Lex Luthor. As I am your creator, you are programmed to obey my every command. Are we clear on that?

B-Zero: Rrrr?

LL: Yes, well, before we begin, I plan on testing your decision-making capabilities. A simple yes or no will suffice. Do you understand?

B-0: Rrr.

LL: I guess that's as close to a "yes" as I'm going to get. Wonderful. Let's begin. You see a rather large missile on a collision course with Metropolis. It's heading straight for the publishers of the *Daily Planet*. What do you do?

B-0: Rrrr?

LL: Grunt once if you'd stop the missile. Remain quiet if you'd let it hit the building.

B-0: Rr.

LL: Hmm. And what if I told you not to stop that particular missile? What if I told you to let it strike its intended target? That's what your master wished. What would you do then?

B-0: . . .

LL: Interesting. You'd let it hit the building if I instructed you to? All those lives would be lost due to your inaction. Remain quiet if you agree.

B-0: . . .

LL: You may be more developed than I originally believed. Still not quite the Superman I'd hoped to clone, but perhaps you'll last the course of the mission at hand.

B-0: Rrr!

LL: Great. Youthful enthusiasm. At least that's one thing you have in common with the Kryptonian. Let's get started, shall we?

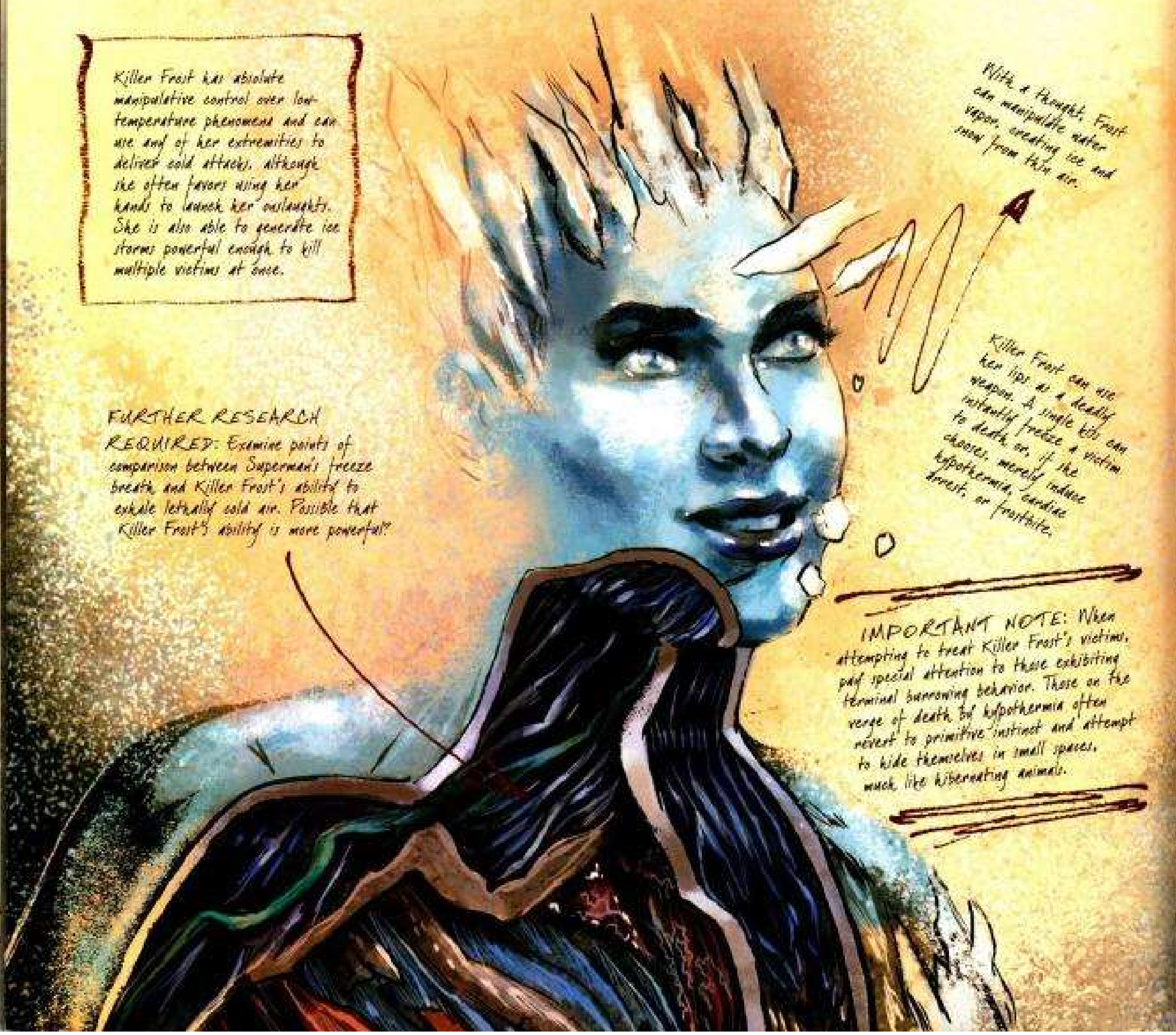
End transcript

Given Luthor's desire to make a "better" Superman, there is the possibility that in future attempts, he may try to reduce his creature's susceptibility to kryptonite. My hope is that his pathological impatience will continue to undermine his efforts.

KILLER FROST

Dr. Caitlin Snow was working at a S.T.A.R. Laboratories arctic outpost, studying a powerful thermodynamic engine, when agents from the criminal organization H.I.V.E. sought to put an end to her progress. Trapped in the machine and desperate, she deliberately sabotaged the coolant system, exposing herself to a compound that turned her skin icy blue and gave her the ability to absorb heat and convert it into pressure waves of cold.

Following the incident, Dr. Snow was able to freeze matter with a thought and create ice constructions and projectiles from the air. However, her new abilities came with a heavy cost. Killer Frost, as she is now known, needs heat the way a typical human needs food, specifically the heat of living creatures. This intense hunger has caused her to take the lives of many innocent men and women and to set her sights on siphoning off the living energy of the Super Hero Firestorm.



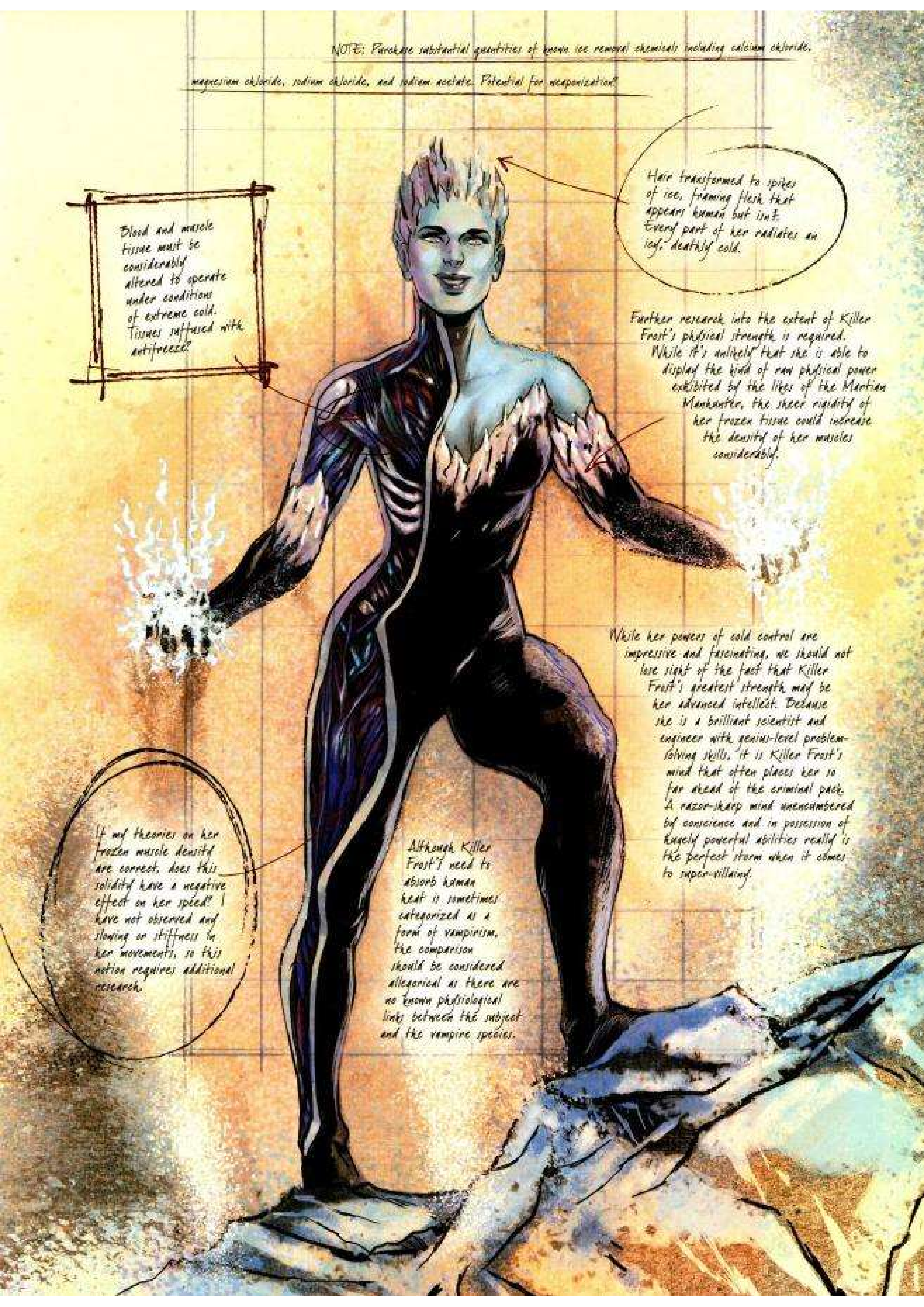
Killer Frost has absolute manipulative control over low-temperature phenomena and can use any of her extremities to deliver cold attacks, although she often favors using her hands to launch her onslaughts. She is also able to generate ice storms powerful enough to kill multiple victims at once.

With a thought, Frost can manipulate water vapor, creating ice and snow from thin air.

Killer Frost can use her lips as a deadly weapon. A single kiss can instantly freeze a victim to death or, if she chooses, merely induce hypothermia, cardiac arrest, or frostbite.

FURTHER RESEARCH REQUIRED: Examine points of comparison between Superman's freeze breath and Killer Frost's ability to exhale lethally cold air. Possible that Killer Frost's ability is more powerful?

IMPORTANT NOTE: When attempting to treat Killer Frost's victims, pay special attention to those exhibiting terminal burrowing behavior. Those on the verge of death by hypothermia often revert to primitive instinct and attempt to hide themselves in small spaces, much like hibernating animals.



NOTE: Purchase substantial quantities of known ice removal chemicals including calcium chloride, magnesium chloride, sodium chloride, and sodium acetate. Potential for weaponization?

Blood and muscle tissue must be considerably altered to operate under conditions of extreme cold. Tissues suffused with antifreeze?

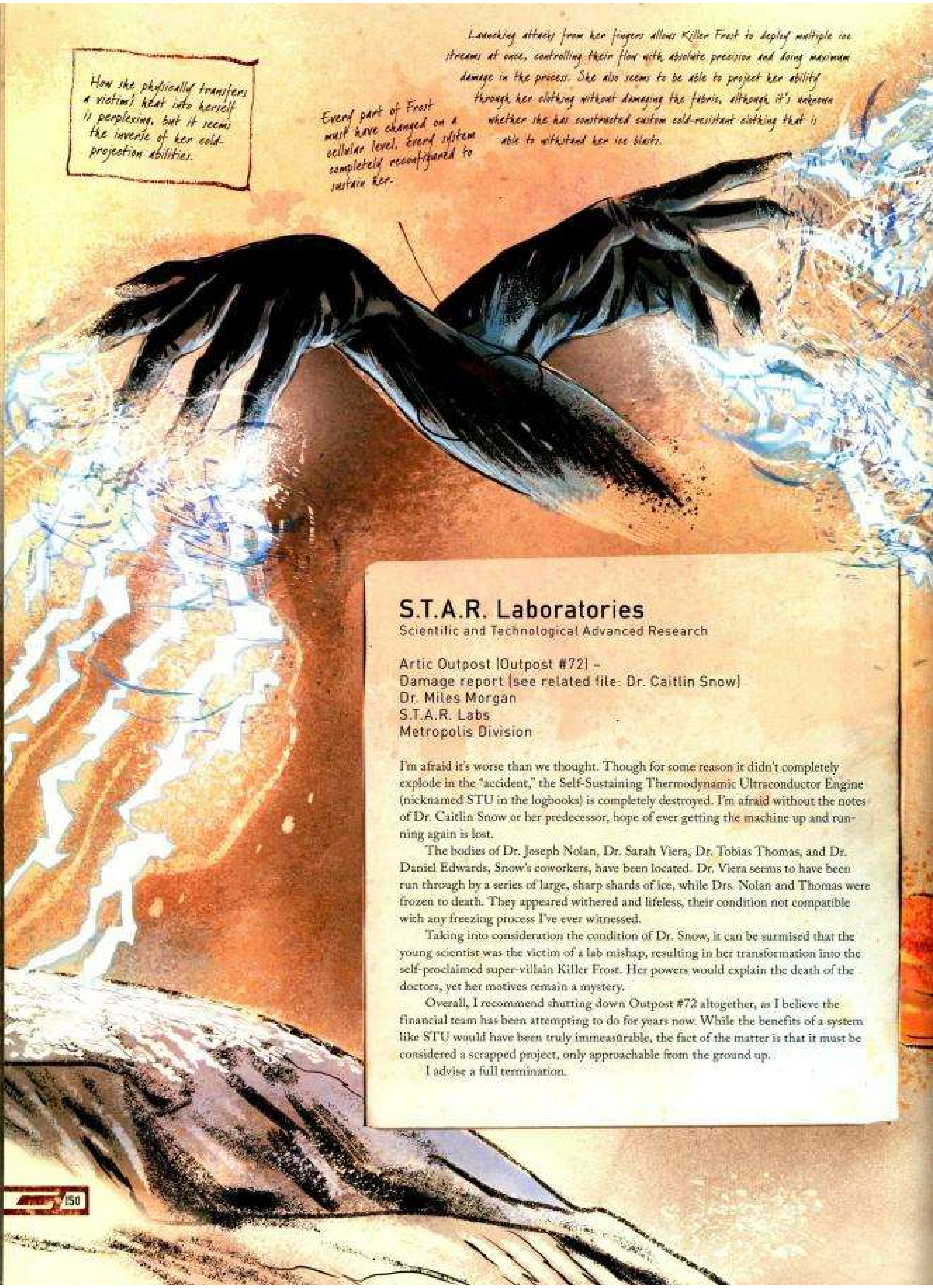
Hair transformed to spikes of ice, framing flesh that appears human but isn't. Every part of her radiates an icy, deathly cold.

Further research into the extent of Killer Frost's physical strength is required. While it's unlikely that she is able to display the kind of raw physical power exhibited by the likes of the Martian Manhunter, the sheer rigidity of her frozen tissue could increase the density of her muscles considerably.

While her powers of cold control are impressive and fascinating, we should not lose sight of the fact that Killer Frost's greatest strength may be her advanced intellect. Because she is a brilliant scientist and engineer with genius-level problem-solving skills, it is Killer Frost's mind that often places her so far ahead of the criminal pack. A razor-sharp mind unencumbered by conscience and in possession of hugely powerful abilities really is the perfect storm when it comes to super-villainy.

If my theories on her frozen muscle density are correct, does this solidity have a negative effect on her speed? I have not observed and slowing or stiffness in her movements, so this notion requires additional research.

Although Killer Frost's need to absorb human heat is sometimes categorized as a form of vampirism, the comparison should be considered allegorical as there are no known physiological links between the subject and the vampire species.



How she physically transfers a victim's heat into herself is perplexing, but it seems the inverse of her cold-projection abilities.

Every part of Frost must have changed on a cellular level, every system completely reconfigured to sustain her.

Launching attacks from her fingers allows Killer Frost to deploy multiple ice streams at once, controlling their flow with absolute precision and doing maximum damage in the process. She also seems to be able to project her ability through her clothing without damaging the fabric, although it's unknown whether she has constructed custom cold-resistant clothing that is able to withstand her ice blasts.

S.T.A.R. Laboratories

Scientific and Technological Advanced Research

Artic Outpost (Outpost #72) -
Damage report (see related file: Dr. Caitlin Snow)
Dr. Miles Morgan
S.T.A.R. Labs
Metropolis Division

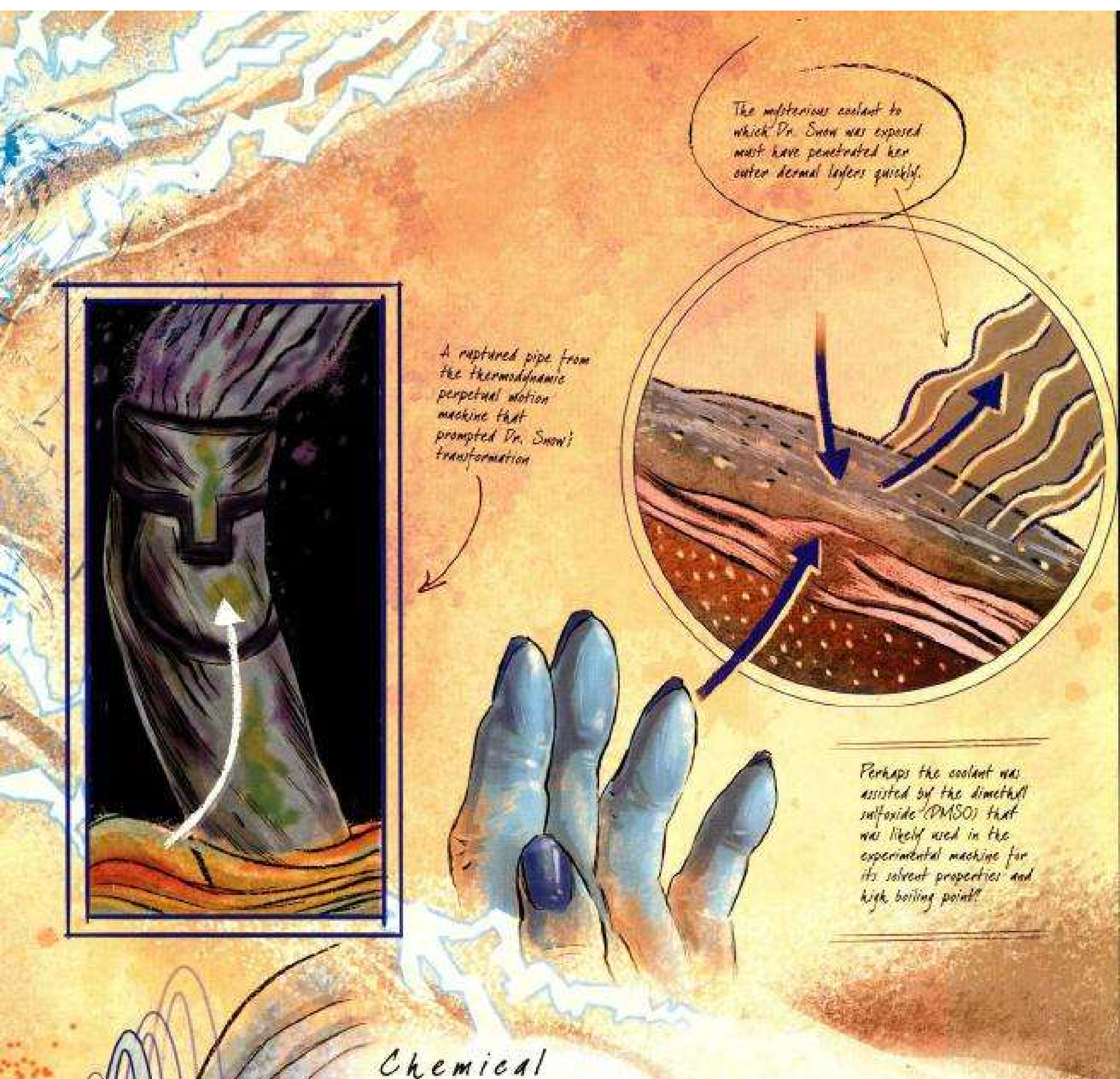
I'm afraid it's worse than we thought. Though for some reason it didn't completely explode in the "accident," the Self-Sustaining Thermodynamic Ultraconductor Engine (nicknamed STU in the logbooks) is completely destroyed. I'm afraid without the notes of Dr. Caitlin Snow or her predecessor, hope of ever getting the machine up and running again is lost.

The bodies of Dr. Joseph Nolan, Dr. Sarah Viera, Dr. Tobias Thomas, and Dr. Daniel Edwards, Snow's coworkers, have been located. Dr. Viera seems to have been run through by a series of large, sharp shards of ice, while Drs. Nolan and Thomas were frozen to death. They appeared withered and lifeless, their condition not compatible with any freezing process I've ever witnessed.

Taking into consideration the condition of Dr. Snow, it can be surmised that the young scientist was the victim of a lab mishap, resulting in her transformation into the self-proclaimed super-villain Killer Frost. Her powers would explain the death of the doctors, yet her motives remain a mystery.

Overall, I recommend shutting down Outpost #72 altogether, as I believe the financial team has been attempting to do for years now. While the benefits of a system like STU would have been truly immeasurable, the fact of the matter is that it must be considered a scrapped project, only approachable from the ground up.

I advise a full termination.



The mysterious coolant to which Dr. Snow was exposed must have penetrated her outer dermal layers quickly.

A ruptured pipe from the thermodynamic perpetual motion machine that prompted Dr. Snow's transformation

Perhaps the coolant was assisted by the dimethyl sulfoxide (DMSO) that was likely used in the experimental machine for its solvent properties and high boiling point?

Chemical Exposure

We know that the engine Dr. Snow was studying had been built with the intention of "breaking" the conventional laws of physics. Dr. Lincoln, Snow's predecessor, was working on a perpetual motion process through thermodynamic conduction. A thermodynamic engine converts heat to mechanical energy through a process of cooling. Dr. Lincoln was experimenting with samples of a substance that was found to have the coolant properties of water, with a complicated chemical makeup analogous to heat-transfer fluid. In this case, it was a liquid that could self-activate to cryogenic temperatures--an antifreeze that could match and counter any level of heat.

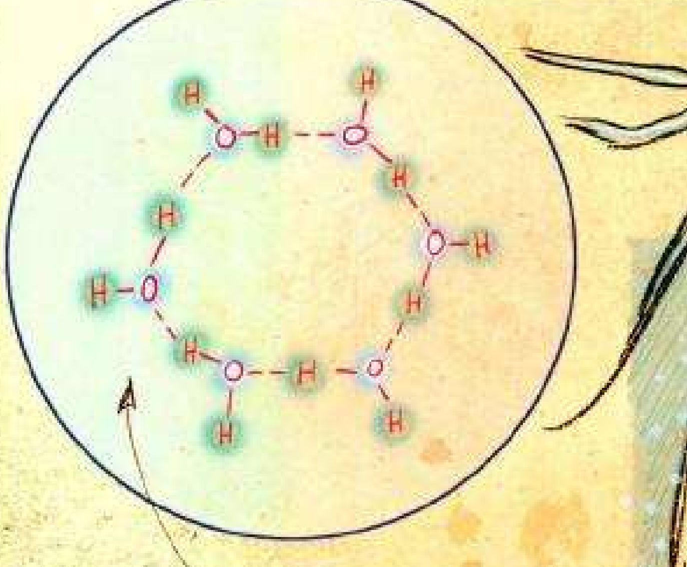
Presumably, Dr. Lincoln was hoping that its self-activation capacity might create an infinite process of conduction in her experimental machine. When Dr. Snow exposed herself to the active fluid, she became the next experiment. She became Killer Frost, a living being who draws heat from other organisms to survive, killing them by hypothermic shock.

Physical Changes

The changes to Dr. Snow's external physiology were dramatic and extreme. Her skin turned a pale, icy blue color, her hair a spike of ice. The combination of the coolant and the explosion must have altered her cellular matrix immediately, perhaps creating cryoprotectant, a substance that protects biological tissue from damage by freezing. Presumably, this chemical--possibly a glycol or glycerol--also tinged her skin its icy color.

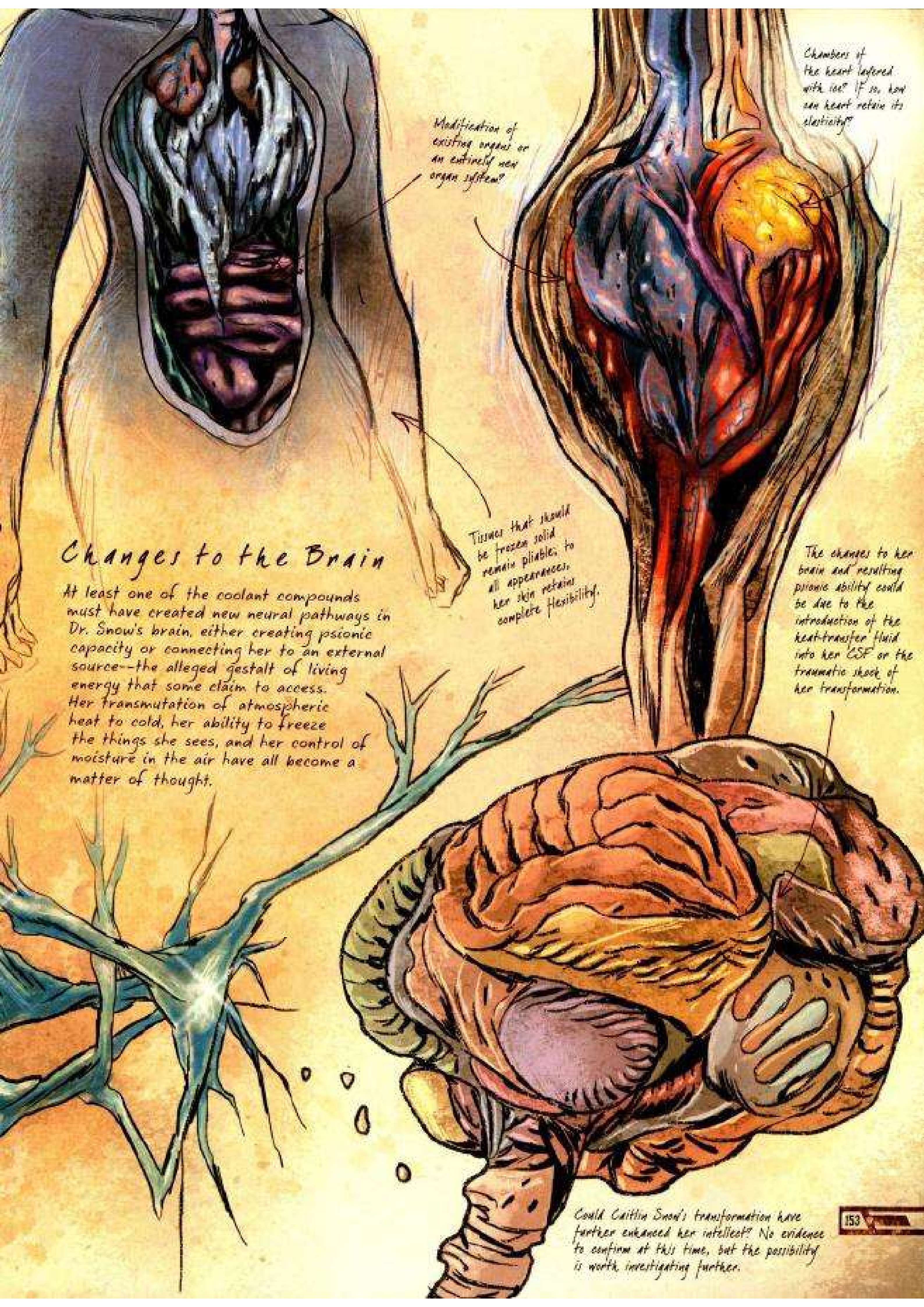
Internally, it seems that she's been completely reformed. Her body temperature is ice-cold, causing her to show up as a dark spot on thermal imaging. Her ambient temperature is probably in the range of -20°F to -40°F, although she can manipulate temperatures with her touch and can freeze living tissue solid. (Liquid nitrogen has a similar effect on human flesh.)

For Snow to have survived this transformation, the synergy of all her internal systems had to change completely--and at once, or systemic failure would be inevitable. My theory is this: Just before a human freezes to death, their peripheral vessels will dilate, sending blood to the skin and extremities, a last mechanism to stave off frostbite. If the coolant had soaked into Snow's freezing skin, the sudden perfusion and dilation could have drawn the self-activating liquid into her blood stream in a dose big enough to hit most of her internal systems at once. Her heart, brain, lungs, and most of her musculature obviously survived the change, although presumably, parts of her have frozen solid. Without a sample of this super coolant to study and an exact replication of the explosion that altered it, I can't be sure.



Humans are durable, but their internal systems are fragile and easily disrupted. How could the millions of complicated chemical processes necessary to sustain life have been so dramatically altered in Killer Frost without death being the result?

Tissue shielded by some kind of cryoprotectant? Chemical composition of substance?



Modification of existing organs or an entirely new organ system?

Chambers of the heart layered with ice? If so, how can heart retain its elasticity?

Tissues that should be frozen solid remain pliable; to all appearances, her skin retains complete flexibility.

Changes to the Brain

At least one of the coolant compounds must have created new neural pathways in Dr. Snow's brain, either creating psionic capacity or connecting her to an external source--the alleged gestalt of living energy that some claim to access. Her transmutation of atmospheric heat to cold, her ability to freeze the things she sees, and her control of moisture in the air have all become a matter of thought.

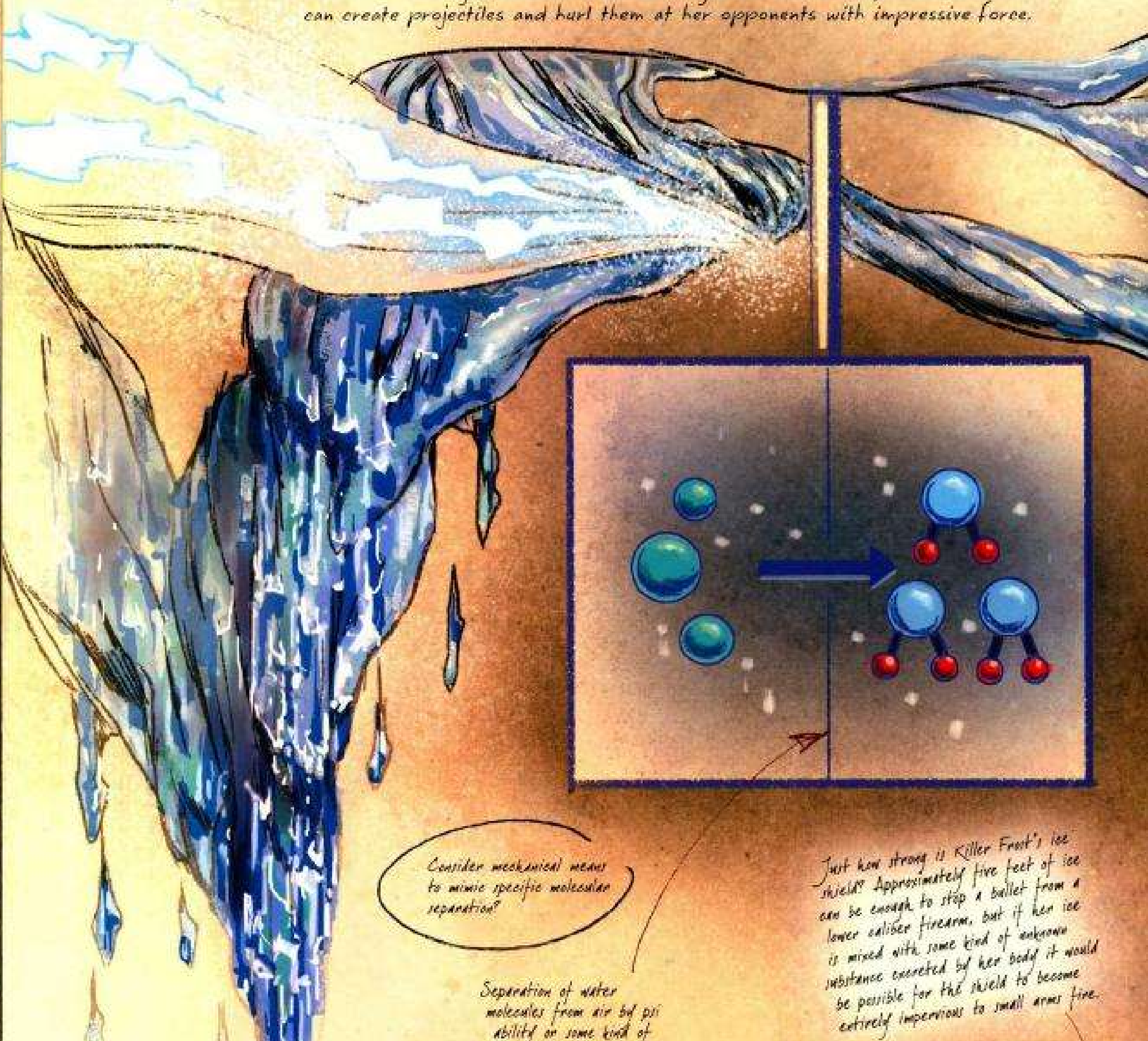
The changes to her brain and resulting psionic ability could be due to the introduction of the heat-transfer fluid into her CSF or the traumatic shock of her transformation.

Could Caitlin Snow's transformation have further enhanced her intellect? No evidence to confirm at this time, but the possibility is worth investigating further.

CAPABILITIES
Cryokinesis

Although the reinforced areas of my standard Batsuits are strong enough to deflect many of Killer Frost's projectile attacks, the less well-armored areas are potentially vulnerable. This deficiency will need to be addressed.

Killer Frost can gather and freeze water molecules from humidity in the air. Water is a polar molecule, attracting other positive and negative charges. This is why water molecules group together. It seems that Killer Frost's internal changes have allowed her to create an external molecular charge, collecting the air's water vapor and condensing and freezing it. She can project the result. Besides shielding herself with ice or using it to slow or stop her attackers, she can create projectiles and hurl them at her opponents with impressive force.



Consider mechanical means to mimic specific molecular separation?

Separation of water molecules from air by psi ability or some kind of induction?

Just how strong is Killer Frost's ice shield? Approximately five feet of ice can be enough to stop a bullet from a lower caliber firearm, but if her ice is mixed with some kind of unknown substance excreted by her body it would be possible for the shield to become entirely impervious to small arms fire.

When creating offensive projectiles, Killer Frost tends to favor simple icicle-shaped skewers, although she can also form more complex constructions, including knives and stabbing weapons.

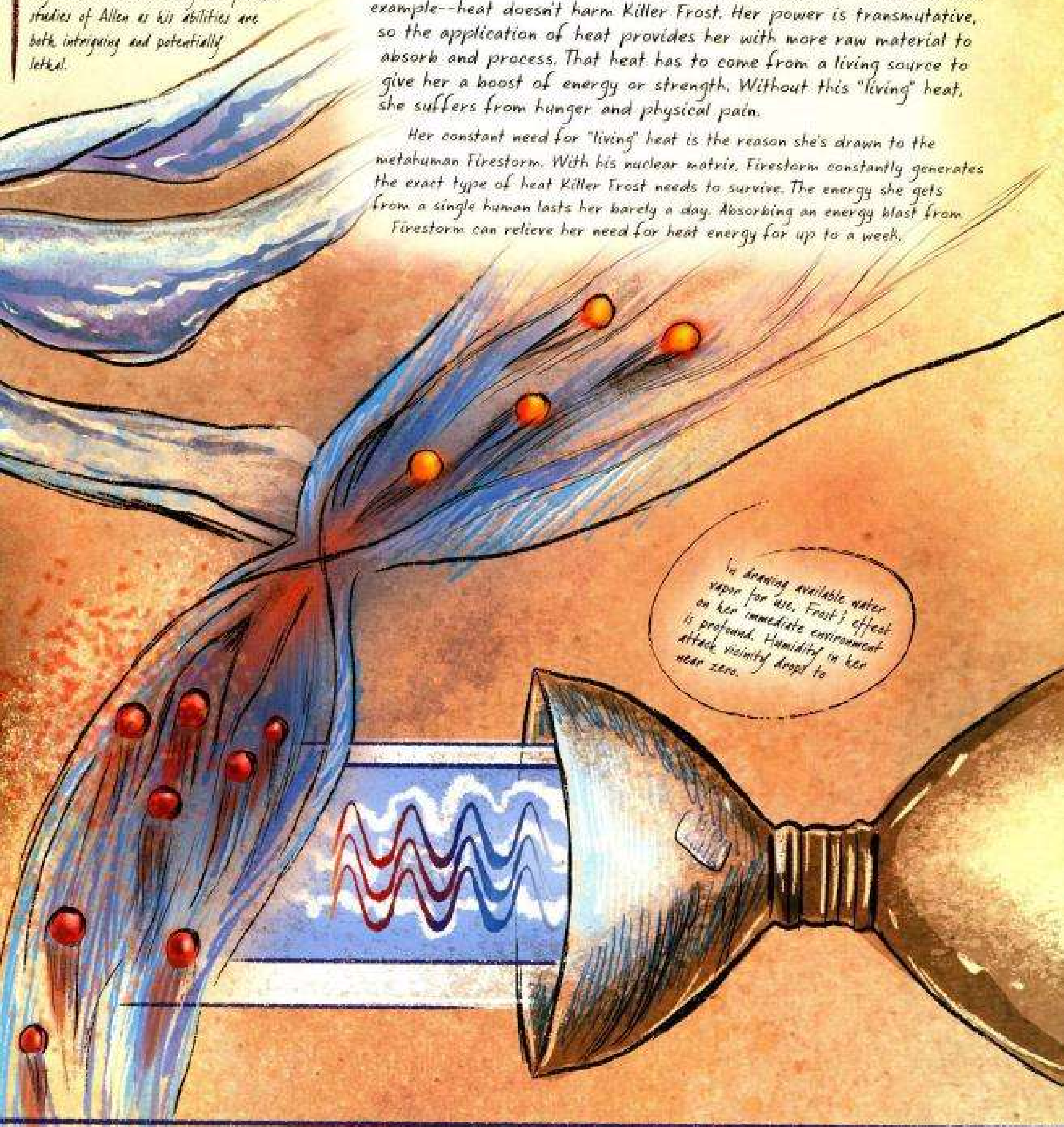
For example, combining sawdust with water and then freezing the mixture creates the composite material pykrete, which shares many of the properties of concrete and could make an effective shield from gunfire.

Is it possible that Killer Frost's ability to draw strength from the heat of others has certain parallels with the power-leeching abilities of Joshua Michael Allen, aka Parasite? Regardless, I should carry out further studies of Allen as his abilities are both intriguing and potentially lethal.

Heat Absorption

Unlike many metahumans that thrive in a cold climate--Mr. Freeze, for example--heat doesn't harm Killer Frost. Her power is transmutative, so the application of heat provides her with more raw material to absorb and process. That heat has to come from a living source to give her a boost of energy or strength. Without this "living" heat, she suffers from hunger and physical pain.

Her constant need for "living" heat is the reason she's drawn to the metahuman Firestorm. With his nuclear matrix, Firestorm constantly generates the exact type of heat Killer Frost needs to survive. The energy she gets from a single human lasts her barely a day. Absorbing an energy blast from Firestorm can relieve her need for heat energy for up to a week.



In drawing available water vapor for use, Frost's effect on her immediate environment is profound. Humidity in her attack vicinity drops to near zero.

FURTHER ACTION REQUIRED:

The input of Firestorm would no doubt be invaluable to this study. Level of cooperation may depend on who is currently inhabiting the Firestorm Matrix.

As mentioned, the super-villain Mr. Freeze has similar abilities to Killer Frost and can also weaponize cold and ice. While Victor Fries gained his powers during a lab accident that lowered his body temperature to 23°F, he doesn't need heat to function like Killer Frost does. It's actually just the opposite: His key weakness is exposure to warm temperatures, which forces him to wear a refrigerated suit in order to survive outside his cooled cell at Arkham Asylum. Frost feeds off heat. And unlike Mr. Freeze, she doesn't require any outside technology. She's the weapon Victor dreams of becoming.

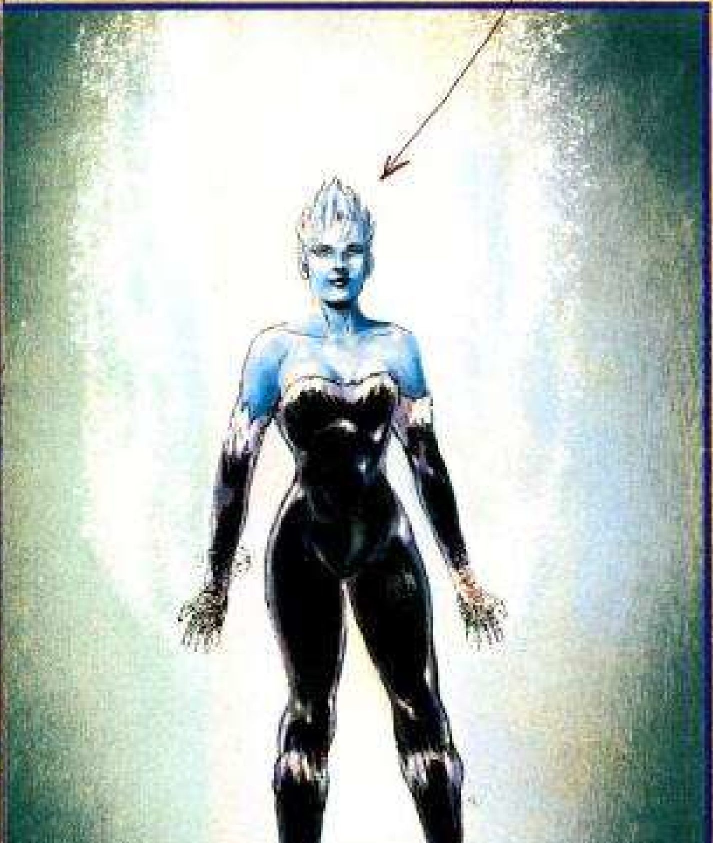
Freeze claims his emotions were dulled by his transformation. Frost seems to be more emotional as a result of hers, often shedding her analytic personality in favor of a violent, passionate one.

When assessing overlap in the cold manipulation abilities of Killer Frost and Mr. Freeze, the analyst runs the risk of drawing overly simplistic conclusions. Fortunately, their differences are much easier to pinpoint. Most notably, Frost has a relatively strong control of her own mental facilities, while Fries exhibits several notable signs of severe mental illness, including highly obsessive behavior and delusions of grandeur.

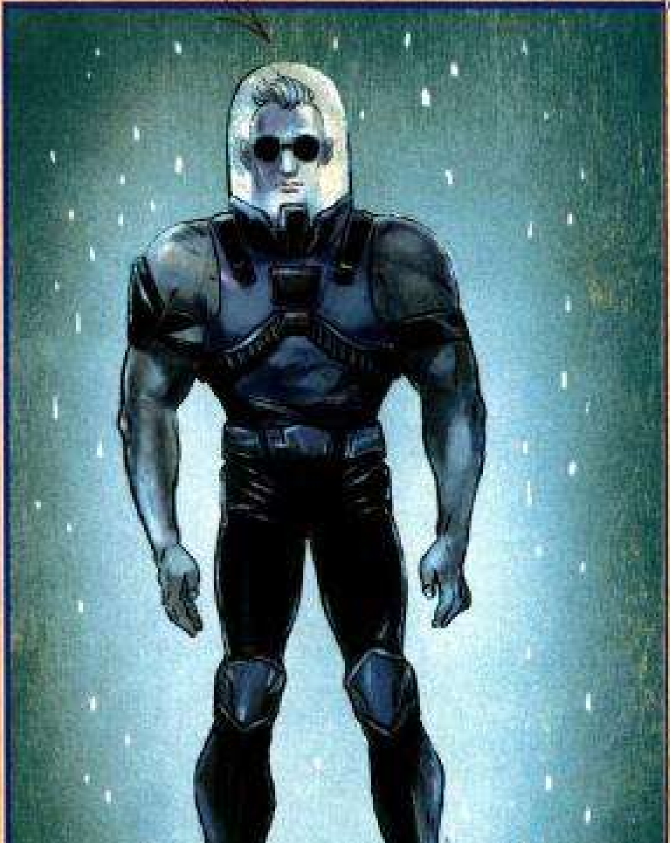
Interesting that Frost and Freeze both possess advanced intellects.

Correlation or coincidence?

While both creatures of the cold, Frost's transformation gave her powers that far surpass Freeze's technology.



Killer Frost would be incapacitated in Freeze's suit, as she needs heat to survive.



Mr. Freeze requires a refrigerated suit to maintain his frigid body temperature.

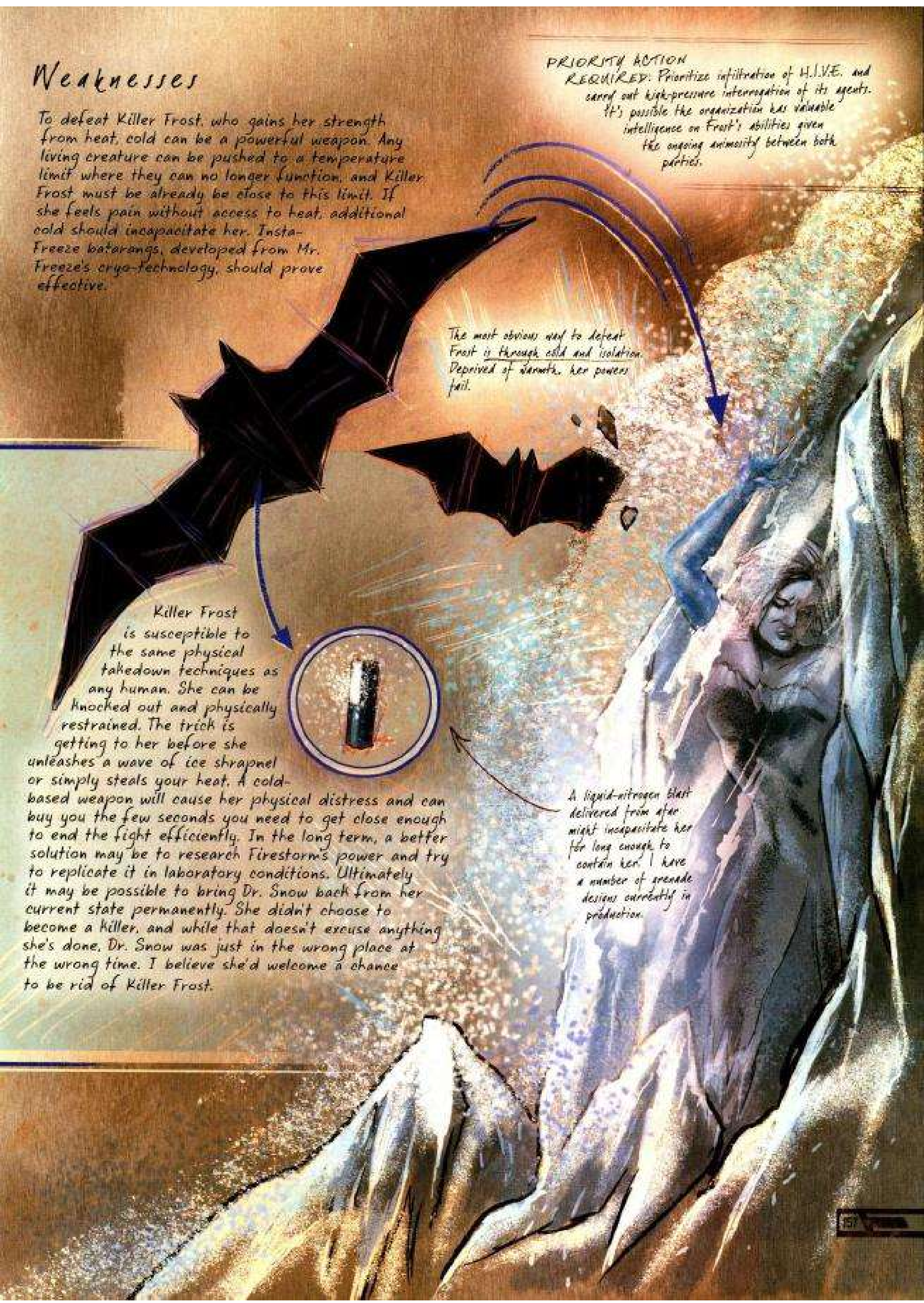
THE CRYOGENIC FLUID that gave Mr. Freeze his powers also seems to have decelerated his aging process. Is it possible that the accident that imbued Killer Frost with her abilities had a similar effect on her own metabolism?

ACTION REQUIRED: Cross-reference findings on Killer Frost and Mr. Freeze with all available data relating to Leonard Snart, aka Captain Cold.

Weaknesses

To defeat Killer Frost, who gains her strength from heat, cold can be a powerful weapon. Any living creature can be pushed to a temperature limit where they can no longer function, and Killer Frost must be already be close to this limit. If she feels pain without access to heat, additional cold should incapacitate her. Insta-Freeze batarangs, developed from Mr. Freeze's cryo-technology, should prove effective.

PRIORITY ACTION REQUIRED: Prioritize infiltration of H.I.V.E. and carry out high-pressure interrogation of its agents. It's possible the organization has valuable intelligence on Frost's abilities given the ongoing animosity between both parties.



The most obvious way to defeat Frost is through cold and isolation. Deprived of warmth, her powers fail.

Killer Frost is susceptible to the same physical takedown techniques as any human. She can be knocked out and physically restrained. The trick is getting to her before she unleashes a wave of ice shrapnel or simply steals your heat. A cold-based weapon will cause her physical distress and can buy you the few seconds you need to get close enough to end the fight efficiently. In the long term, a better solution may be to research Firestorm's power and try to replicate it in laboratory conditions. Ultimately it may be possible to bring Dr. Snow back from her current state permanently. She didn't choose to become a killer, and while that doesn't excuse anything she's done, Dr. Snow was just in the wrong place at the wrong time. I believe she'd welcome a chance to be rid of Killer Frost.

A liquid-nitrogen blast delivered from afar might incapacitate her for long enough to contain her. I have a number of grenade designs currently in production.

CONCLUSION

As I was working on this report, I couldn't help but wonder if what I was doing here was enough. It's several years' worth of scientific conjecture--but it's just that. There's not enough hard data to say conclusively what makes Superman fly; what powers the gods possess; how the brain receives or emits telepathic energy; what anomaly holds Swamp Thing's consciousness together. I have theories, but even with access to the files of some of the world's most clandestine agencies, that's all they are.

It goes without saying that this research must remain hidden. I know firsthand how the Lex Luthors and Ra's al Ghuls of the world can pervert and weaponize information like this.

Metahumans are a part of our daily reality now, and we learn more about them every day. Our planet has become a melting pot of human, alien, metagene, and mortal. Just like my father before me, I'm both an optimist and a cynic, and while the presence of these beings is a source of hope and fascination, I am also compelled to prepare for the worst.

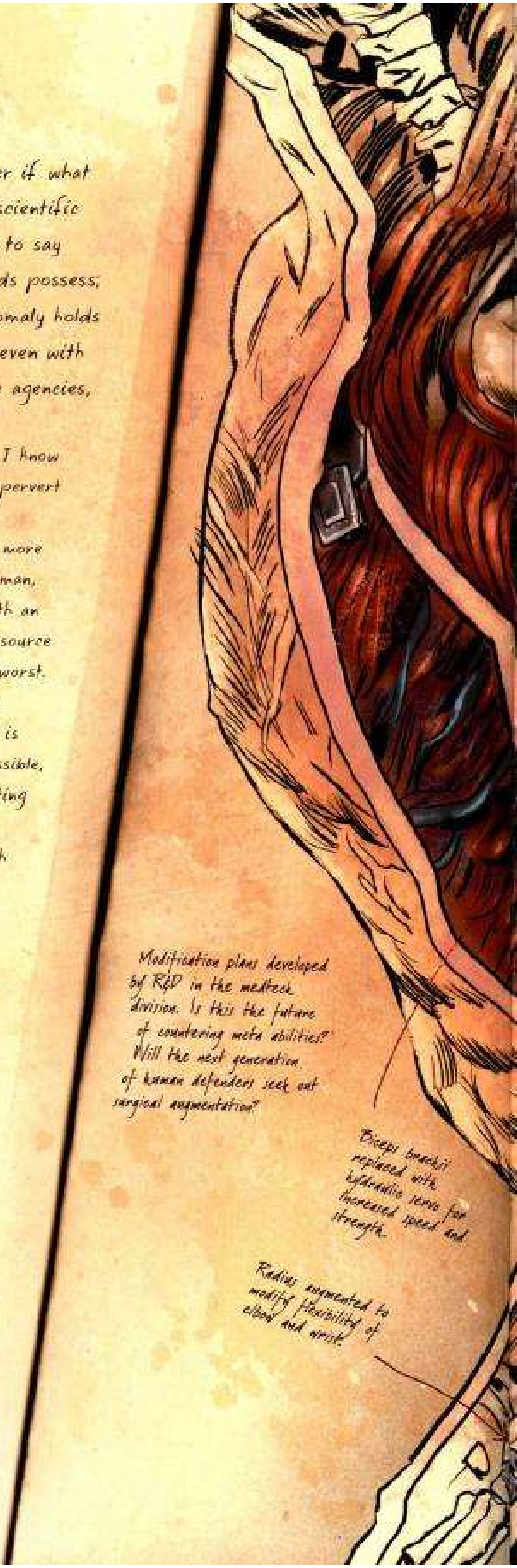
This research represents the first in-depth examination of the processes by which these beings function in our physical world. It is the first step towards understanding the science behind the impossible, and I believe somewhere in these pages may lie the key to protecting humanity from destruction. Our path to fully understanding metahumans starts here, and even though my work may just scratch the surface, for now it has to be enough.

Bruce Wayne

PRIORITY SUBJECTS
FOR FURTHER STUDY:

Wonder Woman
The Flash
Brainiac
Hawkgirl
Amazo
Solomon Grundy
Parasite
Sinestro

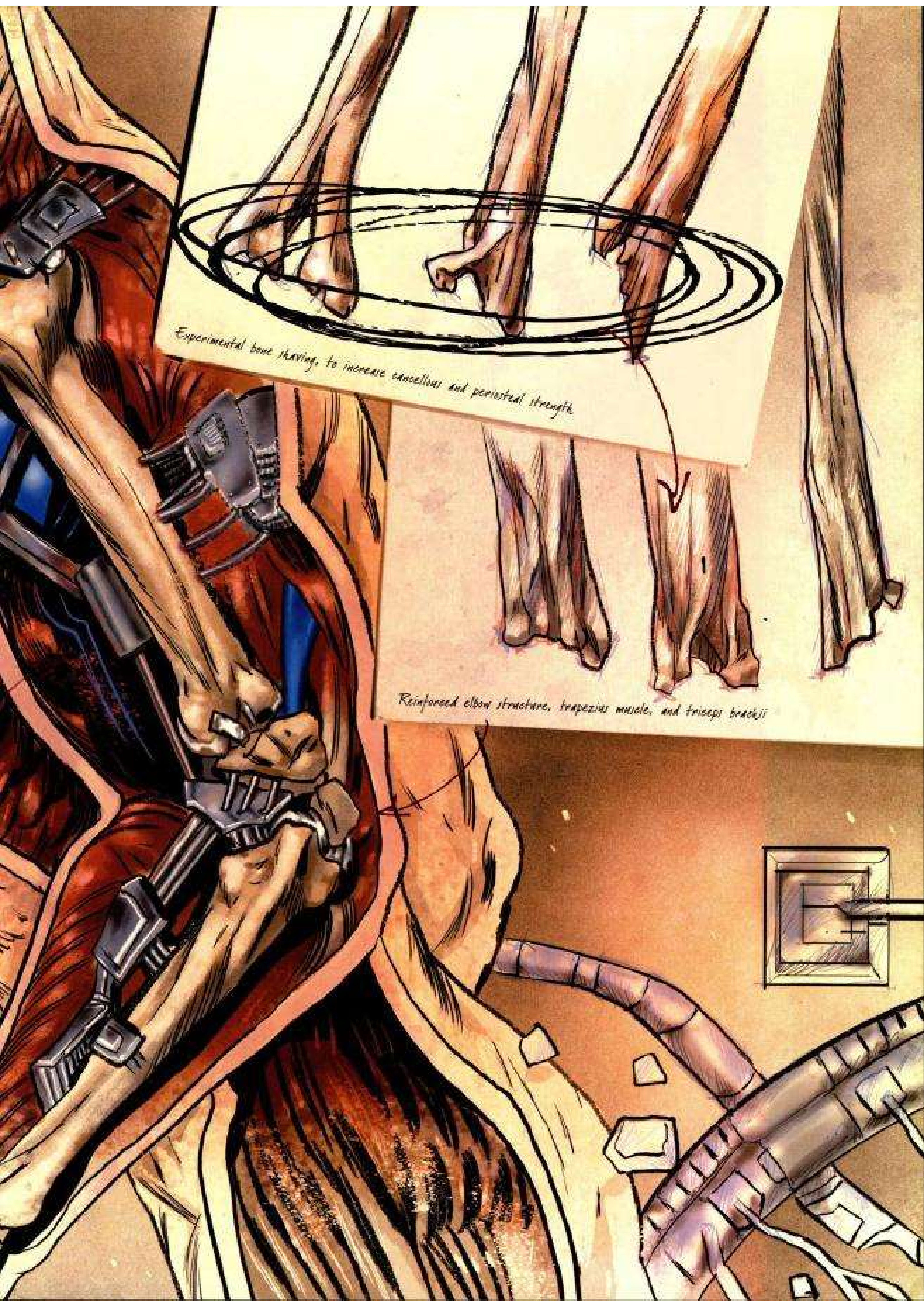
Clayface
Gorilla Grodd
Supergirl
Man-Bat
Metallo
Plastic Man
Mr. Freeze
Captain Cold



Modification plans developed by R&D in the medtech division. Is this the future of countering meta abilities? Will the next generation of human defenders seek out surgical augmentation?

Biceps brachii replaced with hydraulic servo for increased speed and strength.

Radius augmented to modify flexibility of elbow and wrist.


Experimental bone shaving, to increase cancellous and periosteal strength.
Reinforced elbow structure, trapezius muscle, and triceps brachii

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Concerned about the threat that so-called "metahumans" may pose to the world, Batman has begun compiling a detailed dossier on their incredible physiology and abilities. From villains like Killer Croc, Bane, and The Cheetah, to Batman's own comrades, including Superman, Cyborg, and Aquaman, the report explores the Dark Knight's fascinating personal theories on the unique anatomical composition of these formidable individuals and the true source of their powers.

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Also featuring entries on the anatomy and abilities of Doomsday, Bizarro, Darkseid, and Killer Frost, this one-of-a-kind book will change the way we look at metahumans forever.

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